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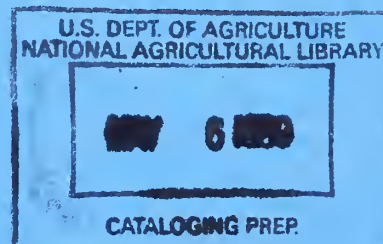
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WATERSHED PLAN
and
ENVIRONMENTAL IMPACT STATEMENT

MIDDLE CREEK WATERSHED

Chase, Marion, and Morris Counties, Kansas



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ADDENDUM

Middle Creek Watershed

Chase, Marion, and Morris Counties, Kansas

This addendum shows annual project costs, benefits, and the benefit-cost ratio based on 7 7/8 percent interest at 1981 installation costs, 1981 current normalized prices for crops, and 1981 prices for other damageable items.

1. Project costs are:

Amortized installation	\$242,800
Operation and maintenance	9,100
Interest during construction	<u>115,300</u>
Total annual for 100 years	\$367,200

2. Project benefits are:

Direct project benefits	\$490,300
Interest during construction	<u>207,000</u>
Total annual for 100 years	\$697,300

3. The project benefit - cost ratio is 1.9:1

WATERSHED PLAN AND ENVIRONMENTAL IMPACT STATEMENT

MIDDLE CREEK WATERSHED

Chase, Marion, and Morris Counties, Kansas

Abstract: This document describes a plan of small dams to solve agricultural flooding problems. Land treatment and woodland habitat management measures are also included to reduce erosion and to enhance terrestrial wildlife habitat. Alternatives considered during planning include: no project action, a primarily nonstructural plan, an environmental quality plan, a national economic development plan, and the recommended plan. Economic benefits exceed costs of the proposed plan. Sponsors will pay 14 percent of the installation costs. Impacts include: reduced upland erosion, reduced sedimentation, reduced flooding, decrease of terrestrial habitat, increase of aquatic habitat, and increase in habitat quality.

This document is intended to fulfill requirements of the National Environmental Policy Act and to be considered for authorization of Public Law 566 funding.

Prepared under the authority of the Watershed Protection and Flood Prevention Act, Public Law 83-566, as amended (16 USC 1001-1008) and in accordance with Section 102 (2) (C) of the National Environmental Policy Act of 1969, Public Law 91-190, as amended (42 USC 4321 et seq).

Prepared by: Middle Creek Watershed Joint Dist. No. 62; Chase County Conservation District; Marion County Conservation District; Morris County Conservation District; Kansas State Conservation Commission; U.S. Department of Agriculture, Soil Conservation Service; U.S. Department of Agriculture, Forest Service; and Kansas Fish and Game Commission.

For additional information, contact: John W. Tippie, State Conservationist, Soil Conservation Service, P.O. Box 600, 760 S. Broadway, Salina, Kansas 67401. Phone: 913-823-4565.

WATERSHED AGREEMENT

between the

Middle Creek Watershed Joint District No. 62
Chase County Conservation District
Marion County Conservation District
Morris County Conservation District

(Referred to herein as sponsors)

State of Kansas

and the

Soil Conservation Service
United States Department of Agriculture

(Referred to herein as SCS)

Whereas, application has heretofore been made to the Secretary of Agriculture by the sponsors for assistance in preparing a plan for works of improvement for the Middle Creek Watershed, State of Kansas, under the authority of the Watershed Protection and Flood Prevention Act, Public Law 83-566, as amended (16 U.S.C. 1001-1008); and

Whereas, the responsibility for administration of the Watershed Protection and Flood Prevention Act, as amended, has been assigned by the Secretary of Agriculture to the SCS; and

Whereas, there has been developed through the cooperative efforts of the sponsors and the SCS a plan for works of improvement for Middle Creek Watershed, State of Kansas, hereinafter referred to as the watershed plan, which plan is annexed to and made a part of this agreement;

Now, therefore, in view of the foregoing considerations, the Secretary of Agriculture, through the SCS, and the sponsors hereby agree on this plan and that the works of improvement for this project will be installed, operated, and maintained in accordance with the terms, conditions, and stipulations provided for in this watershed plan and including the following:

1. The sponsors will acquire, with other than PL-566 funds, such land rights as will be needed in connection with the works of improvement. (Estimated Cost \$202,500.)

2. The sponsors assure that comparable replacement dwellings will be available for individuals and persons displaced from dwellings, and will provide relocation assistance advisory services and relocation assistance, make the relocation payments to displaced persons, and otherwise comply with the real property acquisition policies contained in the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (Public Law 91-646, 84 Stat. 1894) effective as of January 2, 1971, and the Regulations issued by the Secretary of Agriculture pursuant thereto. The costs of relocation payments will be shared by the sponsors and SCS as follows:

	<u>Sponsors</u> (percent)	<u>SCS</u> (percent)	<u>Estimated Relocation Payment Costs</u> (dollars)
Relocation Payments	14	86	0 <u>a/</u>

a/ Investigation has disclosed that under present conditions the project measures will not result in the displacement of any person, business, or farm operation. However, if relocations become necessary, relocation payments will be cost shared in accordance with the percentages shown.

3. The sponsors will acquire or provide assurance that landowners or water users have acquired such water rights pursuant to State law as may be needed in the installation and operation of the works of improvement.

4. The percentages of construction costs to be paid by the sponsors and by SCS are as follows:

<u>Works of Improvement</u>	<u>Sponsors</u> (percent)	<u>SCS</u> (percent)	<u>Estimated Construction Costs</u> (dollars)
11 Floodwater Retarding Dams	0	100	\$1,940,000

5. The percentages of the engineering costs to be borne by the sponsors and SCS are as follows:

<u>Works of Improvement</u>	<u>Sponsors (percent)</u>	<u>SCS (percent)</u>	<u>Estimated Engineering Costs (dollars)</u>
11 Floodwater Retarding Dams	0	100	\$271,600

6. The sponsors and SCS will each bear the costs of Project Administration which it incurs, estimated to be \$7,700 and \$659,600 respectively.

7. The sponsors will obtain agreements from owners of not less than 50 percent of the land above each reservoir and floodwater retarding dam that they will carry out conservation farm or ranch plans on their land.

8. The sponsors will provide assistance to landowners and operators to assure the installation of the land treatment measures shown in the watershed plan.

9. The sponsors will encourage landowners and operators to operate and maintain the land treatment measures for the protection and improvement of the watershed.

10. The sponsors will be responsible for the operation, maintenance, and replacement of the works of improvement by actually performing the work or arranging for such work in accordance with agreements to be entered into prior to issuing invitations to bid for construction work.

11. The costs shown in this plan represent preliminary estimates. In finally determining the costs to be borne by the parties hereto, the actual costs incurred in the installation of works of improvement will be used.

12. This agreement is not a fund-obligating document. Financial and other assistance to be furnished by SCS in carrying out the plan is contingent upon the fulfillment of applicable laws and regulations and the availability of appropriations for this purpose.

13. A separate agreement will be entered into between SCS and sponsors before either party initiates work involving funds of the other party. Such agreements will set forth in detail the financial and working arrangements and other conditions that are applicable to the specific works of improvement.

14. This plan may be amended or revised only by mutual agreement of the parties hereto except that SCS may deauthorize funding at any time it determines that the sponsor has failed to comply with the conditions of this agreement. In this case, SCS shall promptly notify the sponsor in writing of the determination and the reasons for the deauthorization of project funding, together with the effective date. Payments made to the sponsor or recoveries by SCS shall be in accord with the legal rights and liabilities of the parties when project funding has been deauthorized.

15. No member of or delegate to Congress, or resident commissioner, shall be admitted to any share or part of this plan, or to any benefit that may arise therefrom; but this provision shall not be construed to extend to this agreement if made with a corporation for its general benefit.

16. The program conducted will be in compliance with all requirements respecting nondiscrimination as contained in the Civil Rights Act of 1964, as amended, and the regulations of the Secretary of Agriculture (7 CFR 15.1-15.12), which provide that no person in the United States shall, on the ground of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination under any activity receiving Federal financial assistance.

MIDDLE CREEK WATERSHED JOINT
DISTRICT NO. 62
Local Organization

Elmdale, Kansas 66850
Address Zip Code

By Harold Wells
Title President
Date 5-3-82

The signing of this agreement was authorized by a resolution of
the governing body of the MIDDLE CREEK WATERSHED JOINT DISTRICT NO. 62
Local Organization

adopted at a meeting held on May 3, 1982

Dan R. Peterson
Secretary, Local Organization
Dan Peterson
Date 5-3-82

Burdick, Kansas 66838
Address Zip Code

CHASE COUNTY CONSERVATION
DISTRICT
Local Organization

Box F. Cottonwood Falls, Ks. 66845
Address Zip Code

By Pat Sauble
Title Chairman
Date April 19, 1982

The signing of this agreement was authorized by a resolution of
the governing body of the CHASE COUNTY CONSERVATION DISTRICT
Local Organization

adopted at a meeting held on April 19, 1982

Norma Jean Kirk
Secretary, Local Organization
Norma Jean Kirk
Date April 19, 1982

Box F. Cottonwood Falls, Ks. 66845
Address Zip Code

MARION COUNTY CONSERVATION
DISTRICT

Local Organization
Box 177
Marion, Kansas 66861
Address Zip Code

By Dennis Youk
Dennis Youk
Title Chairman
Date April 19, 1982

The signing of this agreement was authorized by a resolution of
the governing body of the MARION COUNTY CONSERVATION DISTRICT
Local Organization

adopted at a meeting held on April 19, 1982

Betty Richmond
Secretary, Local Organization
Betty Richmond
Date April 19, 1982

Marion, Ks 66861
Address Zip Code

MORRIS COUNTY CONSERVATION
DISTRICT

Local Organization
Box 316
Council Grove, Kansas 66846
Address Zip Code

By Charles E. Dalquest
Charles E. Dalquest
Title Chairman
Date May 3, 1982

The signing of this agreement was authorized by a resolution of
the governing body of the MORRIS COUNTY CONSERVATION DISTRICT
Local Organization

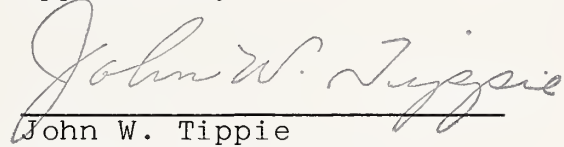
adopted at a meeting held on May 3, 1982

Ernestine Griffith
Secretary, Local Organization
Ernestine Griffith
Date May 5, 1982

Council Grove, Kansas 66846
Address Zip Code

Soil Conservation Service
United States Department of Agriculture

Approved by:



John W. Tippie
State Conservationist

FEB 14 1983

Date

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WATERSHED PLAN AND ENVIRONMENTAL IMPACT STATEMENT

MIDDLE CREEK WATERSHED

Chase, Marion, and Morris Counties, Kansas

SUMMARY

Middle Creek Watershed includes 72,211 acres (112.83 square miles) in Chase, Marion, and Morris Counties in central Kansas.* Population of the watershed is about 1,060. Economy of the area is based on agriculture.

Major economic problems in the area are caused by flooding. The flood plain is about 69 percent cropland. Fast-rising floodwaters cause erosion, reduce crop yields, and increase production costs. Crop and pasture damages average \$337,400 annually within the watershed and \$2,845,800 annually along the Cottonwood River flood plain.

Forecasted changes without the project include continued flooding and erosion problems, with few land use or wildlife habitat changes anticipated.

Two broad objectives, national economic development (NED) and environmental quality (EQ), guided planning. Five alternatives were considered. Alternative 1 (no project) consists of continuing the present conservation program. Alternative 2 (NED) includes 11 floodwater retarding dams. Alternative 3 (EQ) consists of wildlife habitat improvement on rangeland and upper tributary woodlands. Alternative 4, a primarily nonstructural plan that would reduce flood losses, will not produce benefits in excess of costs. Alternative 5, the recommended plan, encompasses both the NED and EQ plans. Impacts of these five alternatives are shown in Table A on page 3.

The recommended plan, for flood prevention and watershed protection, will consist of 11 P.L. 566 floodwater retarding dams to be installed over a 10-year period. It will include a range improvement program to bring 90 percent of the native rangeland to good condition. It will include management of riparian woodlands to improve their value for wildlife.

*All information and data, except as otherwise noted by reference to source, were collected during watershed planning investigations by the Soil Conservation Service, Kansas Fish and Game Commission, and U.S. Forest Service.

Project construction will cause an initial net loss of 541 wildlife habitat units.* The project includes compensation for herbaceous and woody wildlife habitat unit losses as well as aquatic habitat for the Topeka shiner. The project will inundate 4.8 miles of intermittent and 4.9 miles of ephemeral streams, and will provide 199 acres of reservoir surface area.

Installation of the project will cost \$3,431,000 (\$2,938,900 through P.L. 566 and \$492,100 from other sources). Installation cost of the NED measures converted to annual costs with the effects of interest included is \$351,700. Project benefits with the effects of interest included total \$689,500 annually. The project has a benefit-cost ratio of 2.0:1.0.

The recommended plan will have a major impact on flooding, streamflow, and agricultural income. It will have a moderate impact on erosion, sedimentation, land use, prime farmland, fish, wildlife, transportation, wildfires and a state-listed threatened species.

Agencies from which written comments were requested:

Department of the Army	Federal Energy Regulatory
Department of Commerce	Commission
Department of Health and	Friends of the Earth
Human Services	Governor of Kansas
Department of Housing and	Kansas State Historical Society
Urban Development	Kansas Water Office
Department of the Interior	National Audubon Society
Department of Transportation	National Wildlife Federation
Division of Budget (State	Natural Resources Defense
Clearinghouse)	Council
Environmental Defense Fund	Office of Minority Affairs, USDA
Environmental Protection Agency	

Table A is a comparison of alternatives considered in planning. Impacts of the five alternatives on key economic, environmental, and social factors are summarized in the table.

*Habitat units equal the rated quality value (variable 1 to 10) multiplied by acres.

Table A - Summary Comparison of Alternatives

Environmental, Economic or Social Factors	Problems and Opportunities	Present	No Project	(2) NED (11 dams)	(3) EQ (no dams)	(4) Prim. non- structural (no dams) c/	(5) Recommended (11 dams)
Total project cost 1981 dollars	NA ^{a/}	0	410,300	3,081,400	349,600	1,026,100	3,431,000 ^{b/}
Local share of installation cost - 1981 dollars	NA	0	145,800	210,200	281,900	1,026,100	492,100 ^{b/}
Annual O&M cost - 1981 dollars	NA	0	d/	9,100	8,400	25,700	17,500 ^{b/}
Annual costs - 1981 dollars	NA	0	d/	351,700 ^{b/e/}	49,500	104,000	401,200 ^{b/e/}
Annual benefits - 1981 dollars	NA	0	d/	689,500 ^{f/}	d/	26,200	689,500 ^{f/}
Flooding	Reduce agricultural flood damages on 5,139 acres of flood plain - percent reduction	0	5	68	d/		68
Erosion	Reduce other agricultural flood damages on 48 farms - percent reduction	0	6.7	91.5	d/		91.5
Water quality	Reduce scour damage on 468 acres - percent reduction	a/	0	72	0		72
Fire control	Sediment yield to Cottonwood River - tons	23,700	23,000	20,300	23,000	23,000	20,300
Prime farmland	Protect 57,480 acres of grassland and woodlands to average percent loss	1.1	1.1	0.5	0.5	0.5	0.5
Fish and wildlife	Area increased - acres	0	300	1,400	0		1,400
	Manage woodlands to increase value	no	no	no	yes	yes	yes
	Improve rangeland to good or better condition - percent of total acres	70	80	80	90	90	90
	Maintain high quality, unique aquatic habitat, especially spring-fed reaches	yes	yes	yes	yes	yes	yes
Endangered, threatened species	Maintain habitat for Topeka shiner	yes	yes	yes ^{b/}	yes	yes	yes ^{b/}

a/ NA = not applicable

b/ Compensation for habitat losses included

c/ A primarily nonstructural plan could not produce benefits in excess of costs; therefore, not all factors below were evaluated

d/ Not evaluated for this alternative

e/ Includes \$107,500 for interest during construction

f/ Includes \$199,200 for benefits plus interest accrued during construction

INTRODUCTION

The watershed plan and environmental impact statement have been combined into a single document describing plan formulation, expected economic and environmental impacts, and the basis for authorizing federal assistance for implementation.

The sponsoring local organizations are:

Middle Creek Watershed Joint District No. 62
Chase County Conservation District
Marion County Conservation District
Morris County Conservation District

The USDA Soil Conservation Service, Forest Service, and Kansas Fish and Game Commission assisted the local sponsors in developing the plan. Financial and technical assistance was provided by the Kansas State Conservation Commission. Other federal, state, and local agencies also assisted by providing information, reviewing data, and helping with assessments. Middle Creek Watershed was planned together with three other watersheds in the Cottonwood River Basin - Diamond Creek Watershed, Peyton Creek Watershed, and South Fork Watershed.

The Soil Conservation Service is responsible for compliance with the National Environmental Policy Act (NEPA).

PROJECT SETTING

Middle Creek Watershed is comprised of 72,211 acres (112.83 square miles) in the Flint Hills of central Kansas, including 37,352 acres in Chase County, 30,693 acres in Marion County, and 4,166 acres in Morris County. (See Project Map, Appendix E.) The watershed is in the Arkansas-Red-White River Basin designated by Water Resources Council hydrologic code 11070203. Middle Creek originates in the southwest corner of Morris County and the north-eastern part of Marion County, flows southeast into Chase County, and enters the Cottonwood River at Elmdale. Middle Creek Watershed extends into two of the major land resource areas of Kansas -- the Central Loess Plains and the Bluestem Hills. The rolling bluestem grasslands of the Flint Hills with their numerous limestone outcrops and wooded, clear-flowing streams are uniquely beautiful all year.

The Cottonwood Basin Map, Appendix E, shows the relationship of Middle Creek Watershed to other watersheds and features of the basin.

Population of the watershed is estimated at 1,060. There are no incorporated cities in the watershed. Elmdale, on the southeast

border, has a population of 110. Cottonwood Falls, population 1,025, and Strong City, population 677, lie about 5 miles east of the watershed. Marion, population 2,437, about 10 miles to the southwest, also serves the watershed. Emporia, population 26,174, is about 20 miles east. 4/ 26/ 35/ 36/*

There are no identifiable minority or disadvantaged groups in the watershed.

Economy of the area is based on agriculture. Land use is 20.9 percent cropland, and 71.7 percent rangeland. (See Table C I on page 11 for complete land use data.) The average size operating unit is about 1,280 acres for Chase County, 415 acres for Marion County, and 620 acres for Morris County. 27/ Most of the farms in the watershed are diversified, raising primarily wheat, alfalfa, grain sorghums, soybeans, and corn.

The bluestem prairie grasses of the Flint Hills provide stable, economic grazing for livestock. Native grass pastures are tall and mid, warm season grasses: big bluestem, little bluestem, indianguass, switchgrass, sideoats grama, blue grama, and others. Some pastures are leased to absentee livestock owners who hire local ranchers to ride herd and maintain the fences. In 1974 over 17 percent of the watershed's farmers were tenants. 27/

Annual precipitation averages about 31 inches, 1/ 18/ 21/ but records show occurrences of 14 inches of rainfall within a 72-hour period. Seventy-seven percent of the area's floods occur between April and October during the 177-day average growing season. 16/ Approximately 8 percent of the watershed is in the 100-year flood plain, which includes 3,888 acres of cropland (68.6 percent).

PROBLEM AND OPPORTUNITY IDENTIFICATION

Major problems in Middle Creek Watershed are caused by flooding. Other problems in the vicinity include soil erosion and a shortage of water for municipal, industrial, and agricultural use. Opportunities for improvement of wildlife habitat and preservation of habitat for state-listed threatened species also exist.

Flooding Related Problems

The physical nature of the flood plain in Middle Creek Watershed lends itself to dramatic flooding. The nearly flat flood plain is lined by the Flint Hills which drop abruptly to meet the flood plain. Fast rising, high waters of past floods have destroyed many resources. Flooding causes the most serious economic problems in the watershed.

*Numbers appearing in the text correspond to the numbers of the references.

Flood damages were evaluated for 5,668 acres of flood plain (8 percent of the total watershed area). Land use of the evaluated flood plain is as shown below:

Cropland	3,888 acres	68.6 percent
Pastureland	323 "	5.7 "
Rangeland	350 "	6.2 "
Woodland	412 "	7.3 "
Stream Channel & Water Area	529 "	9.3 "
Miscellaneous	166 "	2.9 "
TOTAL	5,668 acres	100.0 percent

Although only 8 percent of the watershed is subject to flooding, the flood plain contains 26 percent of the watershed's cropland. Frequency of bankfull flow ranges from twice a year in some reaches to 9 times per year in others. Frequent localized floods cause considerable damage and inconvenience to farmers in the watershed. Floodwater damage in Middle Creek Watershed averages \$467,600 annually. Damage to properties in the Cottonwood River flood plain average \$3,599,600 each year. Floodwater from Middle Creek is responsible for 21 percent of the damages on the Cottonwood at their confluence; and for about 4 percent of the damage at the basin outlet near Emporia.

Flood damages by type and amount are shown in Table 5, page 39. The Cottonwood Basin Map and the Project Map (Appendix E) show watershed location and identify flood plain reaches within the watershed.

Growing crops and forage grasses are destroyed and/or rendered poor in quality and yield by floods. Flooding also causes losses by hampering planting and harvesting. Floods that occur before or shortly after crops have been planted cause extra tillage and reseeding operations. Farmers estimate their crop yields would increase 10 to 30 percent if flooding could be reduced. 22/ Damage is not substantially affected by duration of flooding, which is usually less than 24 hours.

Floods are also a potential life hazard. Although no loss of human life has been reported from flooding in Middle Creek Watershed, there have been some near-tragedies. 19/ The 1951 and 1969 floods left watermarks 1.5 feet above the floor of one farmhouse, 6 feet above ground level. 22/

The physical characteristics of the watershed make it nearly impossible for flood plain farmers to protect all buildings, fences, and machinery from flood damage. Although most of the buildings and machinery are on the higher points of the flood plain, the larger storms usually cause considerable damage. There is a large expense for cleaning up debris after each flood.

Twenty-three bridges and 11 miles of dirt, gravel, and asphalt road surface are subject to flood damage. Floods destroy bridges, wash away road surfacing, scour road shoulders, and fill road ditches with mud. County and township budgets are not sufficient to make timely replacements and repairs after a flood, hence these facilities are commonly in poor condition.

Middle Creek Watershed accounts for 9.5 percent of the drainage area in the Cottonwood River Basin at their confluence. Because of the shape and size of the basin (see Basin Map, Appendix E), a large storm centered over Middle Creek (or over any tributary of comparable size) can cause major flooding on the Cottonwood River below the confluence. This occurred on June 26, 1969. Storm discharges from Middle Creek can increase a flood peak or the duration of flooding in the lower portion of the Cottonwood River when storms move across the basin from west to east.

If the June 26, 1969 storm occurred now, flood damages would be about \$976,800 based on WRC October 1981 current normalized crop prices and 1980 prices for other items.

Flooding indirectly affects everyone in the area due to loss of use of utilities, transportation systems, and loss of business to those serving the agricultural community, as well as posing a threat to the public safety and causing risk to life. Damages to crops and pastures reduce potential farm income. The total estimated annual income could be \$1,253,500 based on WRC October 1981 prices.

Farmers are restricted from farming more intensively because of the flood hazard. Interviewed farmers are planting crops that can withstand flooding and produce a yield. Most of the farmers report that crops producing a higher net value would be substituted for the flood-tolerant crops if flood protection were available. This shift in cropping pattern could also be accompanied by an increase in yield on acres that would no longer be flooded.

Erosion Related Problems

Erosion is a cause of problems in the watershed. Sheet erosion occurs on much of the unprotected upland cropland. Scour erosion has reduced productivity 10-25 percent on 453 acres of flood plain.

Many farmers interviewed said they plant alfalfa, brome, and wheat on ground that floods every year to keep the soil loss down. ^{22/} Soybeans are seldom planted in frequently flooded areas because the soil becomes too loose and is easily washed away.

Water Problems (Supply and Quality)

Ground water in Middle Creek Watershed is usually adequate for rural domestic demands, except during periods of drought. Many

water wells failed during the drought of the 1950's. During both the 30's and the 50's many farmers and ranchers hauled water for both domestic and livestock needs.

Strong City and Cottonwood Falls are located on the Cottonwood River below the watershed and both use wells for their water supplies (maximum current supply is 317,000 gallons per day). Municipal demand for water for 1990 is estimated at 877,500 gallons per day (GPD). Rural demands for the same year are about 184,000 GPD. 17/

Streamflow has been adequate except during severe droughts. At times, streamflow has stopped, but the numerous pools have helped supply stock water and maintain stream habitat. Livestock have access to many streams; therefore, fecal coliform makes the water unfit to drink unless treated.

Fish and Wildlife Habitat Problems and Opportunities

Overall, the environmental quality in Middle Creek Watershed is good. It is located in the Flint Hills which are predominantly native rangelands used for grazing cattle. About 61 percent of the watershed is rangeland which is relatively well managed. Rangeland wildlife includes prairie chickens, hawks, coyotes, and deer along with numerous nongame species of birds, mammals, reptiles, and amphibians native to the area.

Rangelands in poor or fair condition are not providing optimum habitat for rangeland wildlife. Overgrazing decreases nesting and winter habitat and can ultimately decrease population numbers. Rangelands adjacent to woodlands tend to be the most severely overgrazed, thus reducing the benefits of that edge type habitat.

About 2.5 percent of the watershed is in streams and ponds which provide small amounts of good quality water. Maintaining springs, especially in the upper reaches of Middle Creek, could preserve the habitat of the Topeka shiner, a state-listed threatened species.

About 1.6 percent of the watershed is in woodland and 1.2 percent is miscellaneous land. Woodlands are grazed in many of the upper reaches where they are adjacent to rangeland. Where woodland is adjacent to cropland, it is not grazed and thus provides better quality habitat.

The remaining 21 percent of the watershed is cropland. Control of erosion and sedimentation, good residue management, and contour farming would benefit fish and wildlife.

Other Problems and Opportunities

State fire protection goals are 0.1 percent loss per year for woodlands and 0.5 percent loss per year for grasslands. The Forestry Work Plan 10/ prepared for Middle Creek Watershed by the State and Extension Forester shows that more intensive fire protection is needed on 57,480 acres.

INVENTORY AND ANALYSIS OF RESOURCES

Significant Concerns

During the Middle Creek Watershed assessment, a study of impacts on a range of environmental, social, and economic factors was made, and the significance of these impacts to decision making was evaluated. (See Table B on the following page.) The study showed that alternatives would have little, if any impact on drainage, sedimentation, mineral resources, stream classification, water supply, ground water, irrigation, water quality, air quality, visual or cultural resources, minority populations, recreation, relocations, or federally listed threatened and endangered species. Therefore, these factors will not be intensively discussed although some basic data were collected in order to determine the magnitude of impacts. Significant factors were used to compare alternatives and to present the impacts of the selected plan.

Table B - Resources and Problems Significant to Decision Making

Natural Resources and Problems	Degree of Impact a/	Significance to Decision Making	Remarks
Flooding	Major	High	Reduces agric. income
Drainage	None	Low	
Erosion	Moderate	Medium	Significant scour erosion
Sedimentation	Minor	Low	
Land Use	Moderate	High	
Prime Farmland	Moderate	Medium	
Mineral Resources	None	Low	
Stream Classification	None	Low	
Streamflow	Major	High	Expect most impact on high flows
Water Supply	None	Low	Shortage of M&I water
Ground Water	Minor	Low	Insufficient for M&I
Irrigation	Minor	Low	
Water Quality	Minor	Low	
Air Quality	None	Low	
Fish	Moderate	Medium	
Wildlife	Moderate	Medium	Lacks habitat diversity
Federally Listed	None	Low	
Endangered, Threatened Species			
State-listed Endangered, Threatened Species	Moderate	High	Topeka shiner present
Visual Resources	Minor	Low	
Cultural Resources of National Significance	None	Low	
Minority Populations	None	Low	
Recreation	Minor	Low	
Transportation	Moderate	Low	
Agricultural Income	Major	High	17% watershed population is below low-income level
Relocations	None	Low	None expected
Wildfires	Moderate	Low	

a/ Relative magnitude of impact of alternatives.

Major - Significant

Moderate - Readily apparent and somewhat significant

Minor - Detectable, but slight

None - At a lower level of detectability, if at all

Existing Resources

Most of the soils on the uplands have dark colored friable surface layers. They are readily permeable and the clayey subsoils furnish adequate water storage capacity. These soils are underlain by limestone or cherty limestone. The flood plain soils have dark colored friable surface layers and loamy subsoils. Reading, Tully, and Mason are the main soils on the flood plains and footslopes. Labette and Florence are the main soils on the uplands. 24/ 25/

Middle Creek Watershed contains 31,534 acres of prime farmland and an additional 2,277 acres that could be classified as prime farmland except for frequency of flooding. Land use is shown in Table C I.

Table C I - Present Land Use

<u>Land Use</u>	<u>Total</u>	
	<u>% use</u>	<u>Acres</u>
Cropland	20.9	15,088
Pastureland	2.1	1,547
Rangeland	71.7	51,725
Woodland	1.6	1,146
Stream Channel & Water Area	2.5	1,817
Miscellaneous	<u>1.2</u>	<u>888</u>
TOTAL	100.0	72,211

Current and projected crop yields and present flood plain cropping pattern are shown in the following tables:

Table C II - Current and Projected Crop Yields

<u>Crop</u>	<u>Unit</u>	1981 Average	1981 Average	Projected 2007
		<u>With</u> <u>Flooding</u>	<u>Without</u> <u>Flooding</u>	<u>Without</u> <u>Flooding</u>
Wheat	bu/ac	39.0	51.0	68.0
Corn	bu/ac	78.0	102.0	136.0
Grain sorghum	bu/ac	87.0	114.0	152.0
Sorghum silage	T/ac	23.0	30.0	38.0
Soybeans	bu/ac	30.0	40.0	53.0
Alfalfa	T/ac	4.3	5.7	7.6
Tame pasture	T/ac	3.5	4.6	6.1
Range	T/ac	1.7	2.3	3.0

Table C III - Present Flood Plain Cropping Pattern

<u>Crop</u>	<u>Acres</u>
Wheat	1,896
Corn	331
Grain sorghum	707
Soybeans	462
Alfalfa	439
Tame Pasture	460
Range	84
Woodland	608
Miscellaneous	<u>152</u>
Subtotal	5,139
Channel & Waters	<u>529</u>
Total	5,668

For several years oil and gas have been produced from several fields in the watershed. 6/ 7/ 8/ 9/ Recently there has been renewed activity, and many new shallow gas wells have been drilled and pipelines installed.

Several rock formations and terrace deposits in the watershed have potential for mineral resources. Of these, only building stone is being commercially produced. 32/ 6/ 40/

There are 144 miles of ephemeral, 16 miles of intermittent, and 5 miles of perennial streams in Middle Creek Watershed. All lakes and ponds total 159 acres. There are no wetlands in the watershed. 30/

Surface water is generally usable for human consumption with treatment. 3/ 6/ 34/ 37/

Ground water is available from two general sources and usually the quantity is adequate for rural domestic demands. The major source is the alluvium along the main stem of Middle Creek; the other is the limestone and shale beds in the Council Grove and Chase Groups. Yields range from 100 gallons per minute to less than 10 GPM.

Variation of ground water quality in this watershed is illustrated by tests of the State Geological Survey of Kansas and the U. S. Geological Survey. 6/ 41/ Water tested does not meet U.S. Public Health Service Drinking Water Standards for total dissolved solids and iron.

Middle Creek provides at least 230 man-days of fishing each year. 15/ Recent evidence suggests usage double this amount. The Cottonwood River is considered one of the better fishing streams of Chase County and attracts many out-of-county fishermen. Also, Lake Kahola and

Chase State Fishing Lake provide many fisherman-days each year. Hunting for bobwhite quail, prairie chickens, mourning doves, and white-tailed deer is good throughout the area.

Terrestrial wildlife habitat in the watershed is primarily herbaceous as indicated by land cover (shown in Table I, Appendix D). Middle Creek Watershed also contains some high-quality, unique aquatic habitat associated with spring-fed pools and riffles.

There are no nationally listed endangered and/or threatened species residing in the watershed. 28/ Migrant species that may pass through the watershed are the bald eagle and whooping crane. 29/ The only state-listed threatened or endangered species known in the Middle Creek Watershed is the Topeka shiner (Notropis topeka). 2/ 5/ 31/ Its preferred habitat is relatively clear pools in spring-fed streams, especially near headwaters.

There are no known historical, archeological, or architectural sites 12/ 14/ in the watershed and no known sites for the arts, western settlement, education, society, transportation, or commerce. 11/ 13/ 33/ The Santa Fe Trail runs through this scenic region of the Flint Hills and markers have been placed for visitors along the way.

Transportation routes in Middle Creek Watershed are essential to the economy. The watershed is girded by a system of secondary roads. Highway FAS No. 426 provides a north-south route. Highway FAS No. 92 serves east-west traffic and joins U.S. Highway 50 at the lower end of the watershed. Kansas Highway 150 runs east-west just outside the southern boundary. The Atchison-Topeka-Santa Fe Railroad runs parallel to U.S. 50 on the southeastern boundary.

In 1974 appoximately 9 percent of Chase, Marion, and Morris County farms had gross sales less than \$2,500, and over 40 percent of the farmers worked 100 or more days off the farm. 27/ Although many farmers have low gross sales and maintain off-farm jobs, most of the land in the watershed is controlled by operators who do not work off the farm and whose operations gross over \$10,000 per year. Over 17 percent of the watershed population is below the low income level. Per capita income 26/ for the watershed counties is below State and national averages.

Forecasted Changes Without Project

Without the project, severe flooding will continue. The watershed district plans to build thirteen detention dams under its going program. Farmers are expected to apply land treatment measures on another 1,462 acres of cropland and 7,565 acres of rangeland. This investment will reduce flood damages about 9 percent. Problems related to flooding (discussed on pages 5-7) will continue.

New bridges across Middle Creek will be designed to accommodate floods. Bridge approaches will be lower than bridge decks so floodwater can go around. Bridge construction and maintenance cost will be much greater than it would be if flooding were controlled. Scour channels will continue to enlarge. Some scoured areas will be converted to trees and grass.

Land use in Middle Creek Watershed will remain about the same as the present land use, shown in Table C I on page 11. The only change in land use expected is about 70 acres to be used for detention dams. These structures will inundate some prime farmland, but their impact on flooding is expected to cause a net increase of 272 acres of prime farmland.

Farmers and stockmen will continue to haul water during extremely dry periods. Some farmers will benefit from the water in the detention dams. The urban water needs will probably be met by a lake closer to the source of need, a more economical source piped into the area, and possibly additional wells. 39/

FORMULATION OF ALTERNATIVES

General

The Water Resources Council (WRC) Principles and Standards for water and related land resource planning contain two broad objectives, national economic development (NED) and environmental quality (EQ). The NED objective is to increase the value of the nation's output of economic goods and services or to improve economic efficiency. The EQ objective is to conserve and/or preserve the nonmonetary (intangible) aspects of man's surroundings such as cultural resources, ecological systems, or natural resource qualities.

Early in the formulation process, sponsors listed the problems and opportunities in the watershed. Public input and interdisciplinary, interagency planning produced the final list of problems and opportunities shown in the first column of Table D, page 17.

The major problem is reduced agricultural income directly related to flooding. Measures were then considered to reduce flood damages. Nonstructural measures were considered first, but none other than those practices already being used were found to increase agricultural income. Floodwater retarding dams combined with land treatment will decrease flood damages, reduce erosion, and as a result provide the flood control needed for an increase in agricultural income.

Improvement of rangeland and woodland wildlife habitat for environmental quality could best be accomplished by improved management practices. Opportunities to protect or enhance the unique aquatic habitat for the Topeka shiner are under study.

Five alternatives were formulated by combining various measures to solve problems and realize opportunities. These alternatives are: 1) No Project, the going conservation program including additional ponds and detention dams; 2) NED plan, including 11 floodwater retarding dams and accelerated land treatment technical assistance; 3) EQ plan, including improvement of rangeland and managing livestock use of woodland habitat; 4) a primarily nonstructural plan; and 5) the recommended plan, which includes the 11 structures from the NED plan and the elements of the EQ plan.

A comparison of the alternatives showed that Alternative 5 solves the major problem by decreasing flood damages and erosion damages to the extent of the NED plan, while improving the quality of the environment to the extent of the EQ plan. Alternative 5 is the Recommended Plan.

Formulation Process

An interagency, interdisciplinary team, formed in accordance with the WRC Principles and Standards and SCS NEPA regulations, developed alternative plans and determined the scope of the environmental evaluation. The team considered each problem and opportunity to identify a measure to best meet that need. Some measures were found to meet more than one objective. Alternative plans are described beginning on page 20. The following paragraphs describe rationale and processes followed to arrive at the alternative plans.

Project scoping began with a list of those measures that would help achieve or could be expected to satisfy one or more of the problems or opportunities. An analysis was then made of the expected impact of each measure under consideration. Table D summarizes the results of this effort and shows the basis for selection of combinations of measures to be included in alternative plans. It also displays reasons some measures were not studied further. Measures are defined below:

(a) Accelerated land treatment: installation of resource management systems on cropland, pastureland, rangeland, and woodland at an accelerated rate over that available through the going program (all available programs of technical and financial assistance except P.L. 566). A resource management system is a combination of conservation practices and management measures used to maintain or improve soil, water, plant, and animal resources.

(b) Change in flood plain land use and/or management: converting the use of some flood plain from cropland to grassland.

(c) Change in upland management: installation of improved management systems to improve rangeland and wildlife habitat for environmental quality.

(d) Floodwater retarding dams: single purpose dams designed for temporary storage of floodwater and for its stored release.

(e) Multipurpose reservoirs: reservoirs for floodwater, water supply, and recreation water storage.

Table D - Measures to Satisfy Problems and Opportunities^{a/}

<u>Problems and Opportunities</u>	<u>Accelerated Land Treatment</u>	<u>Flood Plain Changed Land Use and/or Management</u>	<u>Changed Upland Management</u>	<u>Floodwater Retarding Dams</u>	<u>Multi-purpose Reservoirs</u>
To increase farm income:					
Reduce scour damages on 468 acres	N	-	-	+	+
Reduce crop and pasture flood damages on 5,139 acres by 65 percent	N	-	-	+	+
Improve value of native rangeland	+	N	+	N	N
Protect 57,480 acres grass and woods from wildfires	+	N	N	N	N
To reduce farm income losses:					
Reduce flooding on 48 farms	N	N	N	+	+
Reduce crop production costs from soil loss	+	N	N	+	+
To reduce maintenance costs:					
On roads and bridges	N	N	N	+	+
On railroads	N	N	N	+	+
To increase sport fisheries:	N	N	N	+	+
To develop water supply:					
Provide 0.82 MGD	N	N	N	N	+
To enhance environmental or social values:					
Manage woodlands for wildlife	+	+	N	N	N
Manage native rangeland for wildlife	+	N	+	N	N
Maintain high quality, unique aquatic habitat for Topeka shiner	+	N	+	N	N
Reduce scour damage on 468 acres	N	+	N	+	+
Reduce soil loss	+	+	+	N	N
Increase fire protection on 57,480 acres	+	N	N	N	N
(+) Favorable Impact (N) No Impact or Negligible Impact (-) Adverse Impact					

^{a/} Impacts based on compensated fish and wildlife losses

Investigations were made to determine how much needed land treatment had been applied and the amount that will be applied by 1990. This investigation found that about 61 percent of the rangeland is adequately treated and 71 percent of the cropland is adequately protected. Woodland has about 41 percent of the needed land treatment applied. Accelerated technical assistance will be needed to bring additional rangeland up to good or better condition, making a total of 90 percent (see discussion about this EQ measure on page 21) and to meet goals for woodland.

Because of the frequency of flooding on the Middle Creek flood plain, most farmers use a cropping pattern of more flood-tolerant crops, such as alfalfa and brome, rather than higher income crops, such as corn and soybeans, to the extent economically feasible. This measure reduces scour damages and crop damages, but also reduces farm income and crop production, so a further change of cropping patterns in this direction would not satisfy the NED objective and was not considered further.

Changing the current cropping patterns from flood-tolerant, low-income crops to higher-income row crops on the flood plain would result in greater potential farm income, but it could be more than offset by crop and scour damages unless something were also done to reduce flooding; such as building floodwater retarding dams.

Changes in upland use and/or management to improve the value of native rangeland to good or better condition would satisfy the objectives of improving wildlife habitat and improving grazing lands. Changing upland rangeland to cropland is not feasible because much of the rangeland is on steep, rocky soils not suitable for farming. This measure would not satisfy NED objectives and was not considered further.

The nonstructural measures of improving management of riparian woodlands and upland rangeland were included in the EQ plan and in the Recommended Plan. Other nonstructural measures were not economically or environmentally feasible.

Floodwater retarding dams and multipurpose reservoirs for water supply and flood control would solve many of the same problems. Both would increase farm income by reducing scour damages and reducing crop and pasture damages. Both would reduce maintenance costs on roads, bridges, and railroads. Both would reduce losses of farm income from flooding. Both could have favorable impacts on sport fisheries. A multipurpose reservoir could provide a water supply for Strong City and Cottonwood Falls. Both structural measures would benefit the environment by reducing flood plain scour and protecting public safety on the main roads. Structural measures were considered the best alternative to solve the most problems and were evaluated to determine the number and placement of structures to best satisfy the objectives.

The sponsors asked SCS to evaluate the 15 floodwater retarding dam sites listed in the Middle Creek Watershed General Plan 20/ (prepared by the watershed district to meet requirements of the State of Kansas). Preliminary geologic and engineering investigations were made and costs were estimated. Beneficial effects were identified and distributed to each structure. An array of structures from the most feasible to the least feasible was used to measure the incremental effects and identify the most economical system. Table E summarizes the results of this evaluation.

Table E - Incremental Costs and Benefits

<u>Number of Structures</u>	<u>Total Costs</u>	<u>Incremental (Change in) Costs</u>	<u>Total Benefits</u>	<u>Incremental (Change in) Benefits</u>
3 (3,6,10)	\$107,900		\$161,000	
		\$99,800		\$229,100
6 (3,6,10, 4,8,11)	207,700		390,100	
		88,000		232,200
9 (3,6,10, 4,8,11,5, 9,13)	295,700		622,300	
		24,700		33,700
10 (3,6,10, 4,8,11,5,9, 13,12)	320,400		656,000	
		31,300		33,500
11 (3,6,10, 4,8,11,5,9, 13,12,14)	351,700		689,500	
		92,900		40,700
12 (3,6,10, 4,8,11,5,9, 13,12,14,1)	444,600		730,200	
		147,900		79,500
15 (3,6,10, 4,8,11,9, 13,12,14,1, 2,7,15)	592,500		809,700	

The NED plan includes 11 structures as shown above. Eliminating one structure reduces costs \$31,300, but reduces benefits by \$33,500. Conversely, a 12-structure system would increase costs by \$92,900, but increase benefits by only \$40,700.

Four of the potential P.L. 566 structures in the General Plan are not included in the feasible alternatives. They are shown as planning alternatives on the project map in Appendix E.

Several potential structures were tested to see if they could yield 0.82 MGD for water supply. Sites outside the watershed would provide the most economical source. 39/

Consideration was given to enlarging some reservoirs to enhance sport fishery both at the sites and downstream by water releases during dry periods. There was no sponsor found to provide additional money for land rights and construction.

Known habitat requirements of the Topeka shiner were identified and precautionary measures considered in formulation of alternatives.

Wildlife would benefit if all rangeland were improved to good condition. This wildlife habitat improvement could be accomplished through installation of rangeland practices including proper grazing use, planned grazing systems, range seeding, brush control, ponds, and fencing. This could increase farm income.

Riparian woodland in pastures along tributary streams is low in quality for wildlife habitat due to intensive grazing or livestock wintering. A voluntary program to manage these woodland areas could meet this EQ need.

Evaluation of Alternatives

Alternatives considered during planning are described in this section. Costs and other economic, environmental, and social impacts of greatest significance to decision making are compared in Table A, page 3, Table F, page 24, and in Appendix C.

<p>See Table A, page 3, for comparison of Alternative 1 to other alternatives</p>

Alternative 1 (No Project) consists of continuing the present conservation program including ponds and detention dams without project action. Practices will be installed on 1,462 acres of cropland and 7,565 acres of grassland.

The problems and opportunities described on pages 5-9 would remain. Forecasted changes described on page 13 would occur.

Alternative 2 is the national economic development (NED) plan. The NED plan consists of 11 Public Law 566 floodwater retarding dams.

See Table A, page 3; Table F, page 24; & Appendix C to compare impacts of Alternative 2 to other alternatives

Flood damages would be reduced 68 percent and flood plain scour 72 percent. Landscape diversity would be increased by the 11 reservoirs. Terrestrial habitat totaling 199 acres would be converted to aquatic habitat.

Each structure included in the National Economic Development Plan contributes positive net benefits. Environmental concerns may cause one or more of the dams not to be constructed. Topeka shiners have been collected in the streams where dams 4, 9, and 11 are planned. These dams may not be built if the attempt to transplant Topeka shiners to other locations is unsuccessful. If these dams are not constructed, about \$220,000 of flood damage reduction benefits would be foregone. Benefits for the remaining eight structures would be increased slightly. Drainage area controlled would be reduced from 32.75 to 17.21 miles. Flood damages would be reduced 39 percent instead of 68 percent as planned. Flood plain scour damage reduction would be lessened from 72 percent to 41 percent. Landscape diversity would be reduced by the effects of three dams. Conversion of terrestrial habitat to aquatic habitat would be reduced from 199 acres to 106 acres.

See Table A, page 3; Table F, page 24; & Appendix C to compare impacts of Alternative 3 to other alternatives

Alternative 3 is the environmental quality (EQ) plan. The EQ plan consists of: (1) offering accelerated technical assistance to bring 90 percent of the rangeland to a good condition, and (2) offering a program of woodland habitat management along upper tributaries according to the following criteria: (a) it must be a specific area where the landowner is willing to donate an easement, (b) public access would continue to be controlled by the landowner, (c) woodland would not be grazed under most conditions, (d) an informational program concerning the advantage of controlled grazing of woodland habitat along upper tributaries would be initiated, (e) operation and maintenance will be the responsibility of the watershed district, and (f) cost sharing of fences required would be available through the going program.

One hundred nineteen acres of woodland along upper tributaries and 7,570 acres of rangeland would be improved as terrestrial wildlife habitat. If none of these acres were improved, there would

be about 20,000 terrestrial habitat units foregone. If all of the 7,570 acres of rangeland and none of the woodland were treated, then 330 terrestrial habitat units would be foregone. Conversely, if all of the 119 acres of woodland and none of the rangeland were treated, then 19,700 terrestrial habitat units would be foregone.

See Table A, page 3, and Table F, page 24, to compare impacts of Alternative 4 to other alternatives

Alternative 4, a primarily nonstructural plan, consists of planting grass on cropland that is flooded more frequently than once a year and relocating the main road.

Although this alternative would reduce flood damages, it would also reduce agricultural income. Expected net crop income under flooding conditions would be greater with current land use than with more grassland.

As there are no feasible nonstructural means to reduce agricultural flooding that will have more benefit than cost, this alternative was not considered further.

See Table A, page 3; Table F, page 24; & Appendix C to compare impacts of Alternative 5 to other alternatives

Alternative 5 is the Recommended Plan. It consists of all of the elements of the NED and EQ alternatives; building 11 floodwater retarding dams; accelerated technical assistance on rangeland and woodland habitat management according to the specific criteria set forth in the EQ plan. Impacts of the recommended plan are summarized under the NED and EQ alternatives.

The recommended plan contains all of the uncertainties of the NED and EQ plans which have been discussed previously. See NED and EQ alternative discussions.

Comparison of Alternatives

Alternative 1 (No Project) would not solve the agricultural flooding problems, so the sponsors did not consider it a viable alternative.

Alternative 2 (NED) offers the best flood protection, most net economic benefits, most prime farmland, most reduction in flood plain scour, and greatest increase in agricultural income.

Alternative 3 (EQ) offers the most benefit to terrestrial wildlife.

Alternative 4 (primarily nonstructural) would not increase agricultural income or produce benefits in excess of costs.

Alternative 5 (recommended plan) includes both the economic benefits offered by the NED plan and the improved wildlife habitat elements offered by the EQ plan. It increases agricultural income and provides benefits in excess of costs. Sponsors recommend its selection.

Table F on the following page compares the impacts of each alternative on factors significant to decision making.

Table F - Comparing Impacts of Alternatives

Impact	(1)	(2)	(3)	(4)	(5)
	No Project	NED	EQ	Primarily Nonstructural	Recommended
Installation Cost - 1981 dollars	0	3,081,400	349,600	1,026,100	3,431,000
Average annual net economic benefits - 1981 dollars	0	337,800	c/	- 77,800	288,300
Increased annual income to the region - 1981 dollars	0	822,500	c/	a/	822,500
Flood damage reduction - percent	0	68	c/	a/	68
Flood plain scour erosion - tons/year	4,900	2,300	4,900	a/	2,300
Peak flood flow reduction at watershed outlet - percent	0	51	0	a/	51
Wildlife habitat total watershed					
- woodland and odd area habitat units b/	6,671	6,667	6,671	6,671	6,667
- grassland habitat units b/	266,365	266,200	266,365	266,365	266,200
- cropland habitat units	45,264	45,243	45,264	45,264	45,243
- aquatic habitat units	1,487	2,674	1,487	1,487	2,674
Convert terrestrial habitat to aquatic - acres	0	199	0	0	199
Prime farmland - acres	31,800	33,200	31,800	31,800	33,200
Land Use - acres					
- cropland	15,088	15,081	15,088	15,088	15,081
- pastureland	53,273	53,122	53,273	53,273	53,122
- woodland	1,076	1,035	1,076	1,076	1,035
- other	2,774	2,973	2,774	2,774	2,973

a/ This alternative does not produce benefits in excess of costs; therefore, all impacts were not evaluated

b/ Including compensation

c/ Not evaluated

RECOMMENDED PLAN

Purpose and Summary

The project is planned for flood prevention and watershed protection. Measures include 11 floodwater retarding dams, accelerated technical assistance on rangeland, and woodland wildlife habitat management. This section describes the recommended plan elements, effects on physical features, fish and wildlife habitat compensation, cultural resources, permits required, dam safety, costs, installation and financing, and operation and maintenance. For additional details about the recommended plan, see Tables 1, 2, and 3 and the Project Map (Appendix E).

Plan Elements

Conservation districts will offer technical assistance to land-owners to improve 7,570 acres of the rangeland by applying such practices as range seeding, ponds, brush management, proper grazing use, planned grazing systems and fencing for environmental enhancement. This amount added to that now established and that to be treated by the going program will bring 90 percent of the rangeland up to good or better condition.

About 1,220 acres of range will be seeded. This is land that was formerly cropped and has been allowed to go back to grass, but warm-season grasses have not reestablished themselves. In some cases class IV and class VI land now being cropped will be converted to rangeland.

Brush control or management will be applied on 1,150 acres. A combination of mowing, cutting, spraying and burning will be used by ranchers. Precautions will be taken to comply with state pesticide and air pollution controls.

Twenty-nine ponds will be built for livestock water needed at specific locations to help get better livestock grazing distribution.

SCS will offer accelerated technical assistance for land treatment measures.

Overgrazing will be avoided and planned grazing systems will be established. For example, a section of rangeland might be divided into three or four grazing units. Each unit might then be grazed during a specific season one year and the next year grazed during a different season.

The watershed district will offer a wildlife habitat improvement measure to farmers and ranchers on selected tributary woodland areas. This measure is dependent upon ranchers' willingness to grant easements on these areas for wildlife use. Owners of several small tracts

amounting to about 119 acres are likely to participate. The measure includes an information program, development of management plans, and installation of fencing as needed to control livestock access. Controlled grazing and winter feeding will be a part of management plans. Livestock exclusion would be required under most conditions.

Eleven floodwater retarding dams will be installed at locations shown on the Project Map (Appendix E). Each structure will be an earthfill dam with a drop-inlet type principal spillway of reinforced concrete. A typical dam with a drop inlet principal spillway is shown in Appendix E. Release rates will average about 18 cubic feet per second per square mile (CSM) and will not exceed present downstream channel capacities. Stilling basins at principal spillway outlets will dissipate energy and minimize erosion.

The dams will have vegetated emergency spillways to pass runoff safely when reservoir and principal spillway capacities are exceeded. In any one year the chance of operation of the emergency spillway at any site is 4 percent or less. Emergency spillways of some structures will require topsoiling to establish and maintain vegetation.

The 11 structures will each provide floodwater retarding storage varying from 3.15 to 3.78 inches of runoff. Runoff from 32.75 square miles, 29 percent of the watershed, will be controlled. The combined volume of floodwater retarding storage will be 6,013 acre-feet (equivalent to 3.44 inches runoff from the drainage area controlled) with a combined temporary surface area of 775 acres.

All structures are designed for a 100-year accumulation of sediment. Sediment storage capacities vary from 0.38 to 0.74 inches. Combined sediment storage volume for all structures will total 908 acre-feet. Combined surface area of the sediment pools will total 199 acres.

Main borrow areas will be confined to sediment pools and emergency spillway excavations if possible. Where practical, borrow areas will be left rough and uneven to enhance fish production. Borrow material at most dam sites will be clay, silt, fine and coarse sand, some gravel and their combinations.

Most of the floodwater retarding dams are on alluvium in narrow valleys. The alluvium is generally less than 20 feet deep. Depth of soils in most abutments will not exceed 3 feet.

Effects on Existing Physical Features

Project installation will affect roads and bridges, farmsteads, wells, pipelines, and powerlines. See Table 2 for modification and installation costs. At structure 9, farm buildings will be protected by a dike; and at structure 10 a farm access road will be raised.

Fish and Wildlife Habitat Compensation

Table II, Appendix D, shows the acreage of land, by structure site, that sponsors will provide for compensation of wildlife habitat losses. Compensation measures will be located in the general vicinity of each structure; however, the actual location will be determined during land rights acquisition. Landowners' wishes will be considered in locating the wildlife habitat compensation measures. Wildlife habitat compensation measures include establishment and management of native grass and forbs on 59 acres of dam and spillway area, and woody plantings on 33 acres or retention and improvement of existing riparian woodland habitat on 73 acres. A combination of woody planting and retention of existing woodland habitat may be used. Full compensation for woodland habitat losses and partial compensation for herbaceous habitat losses are planned.

Unique Topeka shiner habitat in spring-fed pools may be jeopardized by construction of floodwater retarding dams 4, 9, and 11. Loss of this habitat will be mitigated by sponsors as necessary to meet requirements of the Kansas Fish and Game Commission. Mitigation measures being investigated include transplanting Topeka shiners to other locations with similar habitat. 2/ 42/ The three dams where Topeka shiner have been found are to be built last, giving the transplanting experiment some time to become effective. If transplanting proves unsuccessful, other alternatives including construction at substitute sites, or deletion of structures 4, 9, and 11 from the plan will be considered. These alternatives were developed jointly with the Kansas Fish and Game Commission.

Cultural Resources

Construction personnel will be alerted to watch for archeological resources which may be unearthed during construction. If any are found, SCS will proceed according to requirements, 7CFR656.

Permits Required

A construction permit is required by the State of Kansas for each structural measure in the project. No federal 404 (Section 404 of P.L. 92-500) permits are required for any project measure since all are located on streams having average flow of less than 5 cfs. The watershed district will obtain a permit as needed for taking or affecting the habitat of state-listed threatened or endangered species (specifically the Topeka shiner).

Dam Safety

A breach analysis was made for each dam included in this plan to estimate the damage that might occur if the dam should fail by overtopping. Based on this, each dam has been assigned a hazard classification of either (a), (b), or (c). (See Table 3.)

In the event of failure, damage downstream of a class (a) dam would be limited to farm buildings, agricultural land, or township and country roads. For class (b) dams, damage would be limited to isolated homes, main highways, minor railroads, or interruption in service of relatively important public utilities. In the event of failure of class (c) dams, loss of life or serious damage to homes, industrial and commercial buildings, important public utilities, main highways, or railroads could occur.

If additional development occurs in the breach inundation area of any dam, the hazard potential will increase. Breach hazard information is available from SCS. The information will also be made available to local governments having control over development.

Class (a) dams are planned to have the least amount of flood-water storage, class (b) dams contain intermediate storage, and class (c) dams the greatest amount of storage. Having less storage, class (a) dams have the greatest potential to be overtopped by extreme floods. Class (c) dams are planned to safely pass the maximum probable flood without overtopping but could fail from other causes, and would pose greater danger in case of failure. Other things being equal, failure of a dam with greater storage can cause more damage than one with lesser storage.

Overtopping is just one type of failure; any dam can fail for other reasons unless properly designed, constructed, operated, and maintained. Examples of the most common failures listed in the order most likely to occur, based on historical records ^{43/} are: leakage, outlet works damage, slope instability, inadequate slope protection, overtopping, deterioration, and embankment deformation.

Costs

Project costs are shown in Tables 1 and 2. Cost items are defined in this section.

Accelerated land treatment costs listed in Table 1 with the quantity of each practice includes the estimated construction cost. The cost of planning, layout, and inspection of those measures are included in Table 1 as technical assistance. Project administration costs include agency costs related to administering cost share programs.

Construction costs listed in Table 2 are direct costs for installation of structural measures. Construction includes such items as earth embankment, excavation, reinforced concrete, reinforced concrete pipe, structure appurtenances, fish and wildlife habitat compensation measures, seeding, and fencing.

Engineering services costs for structural measures include all direct and related costs of surveys, geologic site investigations, soil mechanics analysis, designs, construction plans, and construction specifications.

Relocation costs include all payments and services provided according to the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970. The sponsors and SCS expect that no relocations will occur.

Land rights costs are direct and related costs for the right to install, operate, and maintain works of improvement. These costs include land purchases, easements, agreements, permits, and modifications of properties and utilities.

Land rights cost estimates are based on current land values that vary from \$300 per acre for grassland and miscellaneous land to \$750 per acre for flood plain cropland. Land rights cost estimates may exceed actual expenses because some land rights may be donated. Land values were determined by Middle Creek Watershed Joint District No. 62 with SCS concurrence.

Project administration costs include contract administration, review of engineering plans prepared by others, construction inspection, and relocation assistance advisory services.

Cost sharing between Public Law 566 and other sources is shown in the Agreement.

Installation and Financing

Works of improvement will be installed in a 10-year period following authorization of federal assistance under the Watershed Protection and Flood Prevention Act, Public Law 566. Structures 3, 6, 10, 12, 13, and 14 will be built in the first 6 years followed by No.'s 5 and 8. Structures 4, 9, and 11 will be built last because of Topeka shiner considerations. Table G shows distribution of costs anticipated for each fiscal year.

Table G - Distribution of Project Costs by Fiscal Year

<u>Fiscal Year</u>	<u>P.L. 566</u>	<u>Other</u>	<u>Total</u>
Land Treatment			
1	7,400	28,100	35,500
2	6,700	28,200	34,900
3	6,700	28,200	34,900
4	6,700	28,200	34,900
5	6,700	28,200	34,900
6	6,700	28,200	34,900
7	6,700	28,200	34,900
8	6,700	28,200	34,900
9	6,700	28,200	34,900
10	6,700	28,200	34,900
TOTAL	67,700	281,900	349,600
Structural Measures			
1	45,600	26,000	71,600
2	467,900	33,700	501,600
3	337,500	42,600	380,100
4	432,200	14,300	446,500
5	326,400	8,400	334,800
6	220,100	18,500	238,600
7	304,900	33,900	338,800
8	325,900	32,800	358,700
9	205,300	--	205,300
10	205,400	--	205,400
TOTAL	2,871,200	210,200	3,081,400

Middle Creek Watershed Joint District No. 62 has the necessary authority to finance and install the planned project. This includes the right to accept contributions, levy taxes, make assessments against benefited land, issue bonds, and exercise the right of eminent domain. The watershed district has agreed to use these powers as needed.

Each sponsor will pay its own contract administration costs.

Expenses of organizing the watershed district have been paid and current general expenses are being met by an annual ad valorem tax. Future expenses of the sponsors will be paid from funds on hand, funds to be collected through taxes, or through the issuance of general obligation bonds.

Applicable Public Law 566 funds for construction of structural measures will be provided to the local sponsoring organizations through project agreements with SCS.

Prior to signing agreements that obligate P.L. 566 funds, the sponsors will develop a financial management system for control, accountability, and disclosure of Public Law 566 funds received, and for control and accountability for property and other assets purchased with Public Law 566 funds.

Federal technical assistance, engineering services, project administration, and funds for construction are contingent upon congressional appropriations for these purposes.

Landowners will finance and install land treatment measures that are part of the planned project (See Table 1). Cost sharing will be used as available from district, state, and/or federal programs in effect at the time of installation.

The SCS, upon request, will provide technical assistance to the conservation districts for installation of land treatment. The conservation districts and SCS will set priorities for SCS technical assistance. Participation in programs to plan and install land treatment is voluntary, and landowners and operators will make final decisions on land use and practices to be installed.

The SCS will provide technical assistance for application of fish and wildlife measures. The Kansas Fish and Game Commission will also provide technical assistance.

Installation costs of forestry land treatment and fire control measures will be borne by individual landowners, rural fire districts, and federal programs. The cost of accelerated technical forestry assistance will be borne by Public Law 566 through the Kansas State and Extension Forester cooperating with the U.S Forest Service. Technical assistance for the fire control measures will be financed by the Kansas State and Extension Forester through the Fire Control Program.

The Extension Service will assist with the educational phase of the land treatment program.

Land rights for all land treatment measures will be provided by landowners and operators. Administration will be shared by landowners, the watershed district, conservation districts, and SCS. Additionally, any agency offering an assistance program for land treatment will administer its own program.

Middle Creek Watershed Joint District No. 62 has asked SCS to contract for construction of floodwater retarding dams. Construction contracts will be awarded on the basis of competitive bidding. Construction will begin when necessary land treatment has been installed, land rights have been obtained, Public Law 566 funds and technical

assistance are available, and the necessary construction permits obtained. The SCS will also furnish engineering services for the floodwater retarding dams.

The watershed district will furnish needed legal services and will obtain all land rights needed for installation of floodwater retarding dams and wildlife habitat compensation areas. The watershed district will also make arrangements to abandon, move, or modify roads and utilities where necessary.

Operation and Maintenance

Land treatment measures will be maintained by owners and operators of farms on which the measures are installed. Conservation district representatives will periodically inspect land treatment measures, encourage landowners to perform needed maintenance.

Technical assistance to landowners and rural fire districts for operating and maintaining forestry and fire control measures will be provided by the Kansas State and Extension Forester in cooperation with the Forest Service.

An agreement calling for the watershed district to operate and maintain each floodwater retarding dam and its related wildlife habitat and other vegetative measures will be signed with SCS before construction begins. These agreements will conform to Title 120, Part 482 of the Kansas General Manual, and will include provisions for retention, use, and disposal of property acquired or improved with Public Law 566 assistance. Maintenance expected rather frequently includes repairs to fences, selective tree cutting and planting, restricted grazing, mowing or burning and clearing of debris around trash racks. Repairs to major items such as dams and spillways are expected infrequently. SCS will provide technical assistance. Estimated average annual operation and maintenance costs for the structures are \$9,100.

Middle Creek Watershed Joint District No. 62 will be responsible for maintaining drawdown facilities and passing natural streamflow through all structures to meet downstream water rights as provided by the Kansas Water Appropriation Act. The watershed district will make releases necessary for pool drainage for operation and maintenance.

Operation and maintenance of wildlife areas will be in accordance with a wildlife habitat management plan developed by the sponsors and landowners in cooperation with SCS. The plan may include mowing, burning, or grazing.

Each structure will be jointly inspected by SCS and the sponsors immediately after initial filling, annually thereafter, and after major storms. The inspection team is to: review hazard classification,

assess operation and maintenance adequacy, identify unsafe conditions, and specify work needed. A qualified SCS engineer is to assist in the inspection according to Title 120, Part 482, of the Kansas General Manual.

Items of inspection will include, but not be limited to, the principal spillway and its appurtenances, emergency spillway, dam, vegetation on the dam and emergency spillway, fences installed as part of the project, and wildlife habitat measures.

The watershed district will provide access for inspections of the structures, and will keep records of the inspections.

Access, other than for operation and maintenance, will be controlled by landowners. The watershed district will notify landowners and the Kansas Department of Health and Environment (KDHE) of the need for sanitary facilities if significant recreational use occurs. KDHE will offer technical assistance to control mosquitos and other disease carriers.

TABLE 1 - ESTIMATED INSTALLATION COST

Middle Creek Watershed, Kansas

Installation Cost Item	Unit	Number	Estimated Cost (Dollars) ^{a/}						TOTAL
			P. L. 566 Funds			Other			
			SCS ^{b/}	FS ^{b/}	Total	SCS ^{b/}	FS ^{b/}	Total	
<u>LAND TREATMENT - ACCELERATED</u>									
Environmental Quality									
Rangeland Improvement									
Proper Grazing Use	acres	7,570							7,600
Planned Grazing Systems	acres	7,080							17,700
Brush Control	acres	1,150							17,300
Ponds	no.	29							102,500
Range Seeding	acres	1,220							91,500
Wildlife Upland Habitat Management	acres	119							27,800
Forest Service									
Forest Management	acres	400						4,000	4,000
Fire Control	acres	57,480						12,000	12,000
Technical Assistance			61,700	6,000	67,700			1,500	69,200
TOTAL LAND TREATMENT			61,700	6,000	67,700	264,400	17,500	281,900	349,600
<u>STRUCTURAL MEASURES</u>									
Floodwater Retarding Dams	no.	11	2,871,200		2,871,200	210,200		210,200	3,081,400
TOTAL PROJECT			2,932,900	6,000	2,938,900	474,600	17,500	492,100	3,431,000

^{a/} Price base 1981^{b/} Federal agency responsible for assistance in installation of works of improvement

TABLE 2 - ESTIMATED COST DISTRIBUTION
STRUCTURAL MEASURES

Middle Creek Watershed, Kansas

(Dollars)^{a/}

Item	Installation Cost P. L. 566 Funds				Installation Cost - Other Funds			Total Cost
	Construction	Engineering	Project Admin.	Total P. L. 566	Land Rights	Project Admin.	Total Other	
STRUCTURAL MEASURES								
Floodwater Retarding Dams								
3	126,600	17,700	43,100	187,400	8,900	500	9,400	196,800
4	204,500	28,600	69,500	302,600	17,700	800	18,500	321,100
5	124,700	17,500	42,400	184,600	7,900	500	8,400	193,000
6	199,200	27,900	67,700	294,800	15,800	800	16,600	311,400
8	230,500	32,300	78,400	341,200	13,400	900	14,300	355,500
9	226,000	31,600	76,800	334,400	33,100 ^{b/}	800	33,900	368,300
10	87,300	12,200	29,700	129,200	18,200 ^{c/}	400	18,600	147,800
11	306,500	42,900	104,200	453,600	31,600	1,200	32,800	486,400
12	136,300	19,100	46,300	201,700	14,500	600	15,100	216,800
13	131,400	18,400	44,700	194,500	14,500	500	15,000	209,500
14	167,000	23,400	56,800	247,200	26,900	700	27,600	274,800
GRAND TOTAL	1,940,000	271,600	659,600	2,871,200	202,500	7,700	210,200	3,081,400

a/ Price Base 1981

b/ Includes \$2,200 to dike or flood proof buildings to minimum easement elevation

c/ Includes \$4,900 to raise farmstead access road to top of dam elevation

TABLE 3 - STRUCTURAL DATA
DAMS WITH PLANNED STORAGE CAPACITY

Middle Creek Watershed, Kansas

ITEM	UNIT	STRUCTURE NUMBER						
		3	4	5	6	8	9	
Hazard Class		a	a	a	a	a	a	
Seismic Zone		2	2	2	2	2	2	
Drainage Area	Sq. Mi.	1.44	4.33	1.61	3.12	3.22	5.81	
Runoff Curve No. (1-day)(AMC II)		79	79	79	76	78	80	
Time of Concentration (τ_c)	Hrs.	0.7	1.3	0.7	2.2	1.3	2.1	
Elevation Top of Dam	Ft.	1,420.6	1,433.5	1,439.0	1,365.0	1,375.7	1,398.2	
Elevation Crest Emergency Spillway	Ft.	1,415.6	1,428.5	1,434.0	1,360.0	1,370.7	1,393.2	
Elevation Crest Inlet	Ft.	1,403.5	1,411.2	1,419.5	1,346.0	1,353.0	1,380.7	
Maximum Height of Dam	Ft.	32	34	31	36	44	33	
Volume of Fill	Cu. Yds	52,200	91,200	47,500	82,500	112,500	88,300	
Total Capacity ^{a/}	Ac. Ft.	279	871	315	591	670	1,233	
Sediment Submerged	Ac. Ft.	35	83	39	63	86	173	
Sediment Aerated	Ac. Ft.	1	5	1	4	5	10	
Floodwater Retarding	Ac. Ft.	243	783	275	524	579	1,050	
Surface Area								
Sediment Pool	Acres	9	18	9	15	17	34	
Floodwater Retarding Pool ^{a/}	Acres	31	79	31	65	54	123	
Principal Spillway Design								
Rainfall Volume (1-day)	In.	6.10	6.10	6.10	6.10	6.10	6.40	
Rainfall Volume (10-day)	In.	9.90	9.90	9.90	9.90	9.90	10.50	
Runoff Volume (10-day)	In.	5.29	5.29	5.29	4.75	5.11	5.99	
Capacity of Conduit (Max.)	c.f.s.	32	66	32	35	36	166	
Dimensions of Conduit	In.	18	24	18	18	18	36	
Emergency Spillway - Frequency Operation	% Chance	4	4	4	4	4	3	
Emergency Spillway Type								
Emergency Spillway Bottom Width	Ft.	Veg.	Veg.	Veg.	Veg.	Veg.	Veg.	
Emergency Spillway Exit Slope	%	40	40	40	40	40	100	
Emergency Spillway Hydrograph								
Rainfall Volume	In.	5.70	5.70	5.70	5.70	5.70	7.00	
Runoff Volume	In.	3.41	3.41	3.41	3.12	3.32	4.69	
Storm Duration	Hrs.	6	6	6	6	6	6	
Velocity of Flow (V_e) ^{b/}	Ft./Sec.	0.2	c/	0.2	c/	c/	4.8	
Max. Reservoir Water Surface Elevation	Ft.	1,415.8	c/	1,434.2	c/	c/	1,394.8	
Freeboard Hydrograph								
Rainfall Volume	In.	8.30	8.30	8.40	8.30	8.30	11.20	
Runoff Volume	In.	5.79	5.79	5.79	5.43	5.67	8.67	
Storm Duration	Hrs.	6	6	6	6	6	6	
Max. Reservoir Water Surface Elevation	Ft.	1,418.7	1,432.6	1,437.2	1,363.3	1,374.8	1,398.2	
Discharge per Foot of Width (O_e/b)	Ac. Ft.	3.8	9.8	4.4	7.3	7.6	11.6	
Bulk Length	Ft.	300	250	250	250	380	370	
Capacity Equivalents								
Sediment Volume	In.	0.47	0.38	0.47	0.40	0.53	0.59	
Floodwater Retarding Volume	In.	3.16	3.39	3.20	3.15	3.37	3.39	

a/ Crest of emergency spillway

b/ Maximum during passage of hydrograph

c/ Emergency spillway hydrograph is contained below the crest of the emergency spillway

TABLE 3 - STRUCTURAL DATA
DAMS WITH PLANNED STORAGE CAPACITY

Middle Creek Watershed, Kansas

ITEM	UNIT	STRUCTURE NUMBER				TOTAL
		10	11	12	13	14
Hazard Class		a	a	b	a	a
Seismic Zone		2	2	2	2	2
Drainage Area	Sq. Mi.	1.40	5.40	2.01	1.75	2.66
Runoff Curve No. (1-day)(AMC II)		80	79	79	80	81
Time of Concentration (T_c)	Hrs.	1.0	3.2	2.0	1.0	2.0
Elevation Top of Dam	Ft.	1,423.4	1,392.1	1,408.9	1,469.7	1,469.1
Elevation Crest Emergency Spillway	Ft.	1,418.4	1,387.1	1,403.0	1,464.7	1,464.1
Elevation Crest Inlet	Ft.	1,410.6	1,368.7	1,390.5	1,457.0	1,455.0
Maximum Height of Dam	Ft.	23	41	31	26	25
Volume of Fill	Cu. Yds.	31,300	145,600	44,800	46,300	65,800
Total Capacity ^{a/}	Ac. Ft.	296	1,224	437	381	624
Sediment Submerged	Ac. Ft.	49	134	53	65	84
Sediment Aerated	Ac. Ft.	2	5	3	4	4
Floodwater Retarding	Ac. Ft.	245	1,085	381	312	536
Surface Area						
Sediment Pool	Acres	13	21	12	22	29
Floodwater Retarding Pool ^{a/}	Acres	57	118	60	59	98
Principal Spillway Design						
Rainfall Volume (1-day)	In.	6.10	6.40	6.80	6.10	6.10
Rainfall Volume (10-day)	In.	9.90	10.50	11.00	9.80	9.80
Runoff Volume (10-day)	In.	5.48	5.80	6.28	5.39	5.58
Capacity of Conduit (Max.)	c.f.s.	27	70	57	32	28
Dimensions of Conduit	In.	18	24	24	18	18
Emergency Spillway - Frequency Operation	% Chance	4	3	2	4	4
Emergency Spillway Type		Veg.	Veg.	Veg.	Veg.	Veg.
Emergency Spillway Bottom Width	Ft.	40	120	120	40	40
Emergency Spillway Exit Slope	%	4	4	4	4	4
Emergency Spillway Hydrograph						
Rainfall Volume	In.	5.70	7.00	8.30	5.70	5.70
Runoff Volume	In.	3.51	4.58	5.79	3.51	3.61
Storm Duration	Hrs.	6	6	6	6	6
Velocity of Flow (V_e) ^{b/}	Ft./Sec.	0.2	3.8	5.5	c/	c/
Max. Reservoir Water Surface Elevation	Ft.	1,418.5	1,388.4	1,405.0	c/	c/
Freeboard Hydrograph						
Rainfall Volume	In.	8.30	11.20	14.30	8.30	8.30
Runoff Volume	In.	5.91	8.54	11.54	5.91	6.03
Storm Duration	Hrs.	6	6	6	6	6
Max. Reservoir Water Surface Elevation	Ft.	1,420.4	1,392.1	1,407.4	1,467.3	1,466.6
Discharge per Foot of Width (O_e) ^{b/}	Ac. Ft.	3.0	10.5	17.9	3.8	6.1
Bulk Length	Ft.	400	530	440	400	400
Capacity Equivalents						
Sediment Volume	In.	0.68	0.48	0.52	0.74	0.62
Floodwater Retarding Volume	In.	3.28	3.77	3.56	3.34	3.78

^{a/} Crest of emergency spillway

^{b/} Maximum during passage of hydrograph

^{c/} Emergency Spillway hydrograph is contained below the crest of the emergency spillway

TABLE 4 - ANNUALIZED ADVERSE NED EFFECTS OF STRUCTURAL MEASURES

Middle Creek Watershed, Kansas

(Dollars)^{a/}

Evaluation Unit	PROJECT OUTLAYS		OTHER PROJECT COST	Total
	Amortization of Installation Cost	Operation, Maintenance, and Replacement Cost	Interest During Installation	
11 Floodwater Retarding Dams	235,100	9,100	107,500	351,700
GRAND TOTAL	235,100	9,100	107,500	351,700

^{a/} Price Base 1981. Discounted and annualized at 7 5/8 percent interest rate for 100 years.

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TABLE 5 - ESTIMATED AVERAGE ANNUAL FLOOD DAMAGE
REDUCTION BENEFITS

Middle Creek Watershed, Kansas

(Dollars)^{a/}

Item	Estimated Average Annual Damage		Damage Reduction Benefits Within the Watershed
	Without Project	With Project	Structural Measures
Floodwater			
Crop and Pasture	337,400	110,000	227,400
Other Agricultural	101,800	29,200	72,600
Non-agricultural			
Road and Bridge	25,000	10,400	14,600
Subtotal	464,200	149,600	314,600
Erosion			
Flood Plain Scour	3,400	1,800	1,600
Subtotal	467,600	151,400	316,200

Item	Estimated Average Annual Damage		Damage Reduction Benefits to Cottonwood River Properties Outside the Watershed
	Without Project	With Project	Structural Measures
Floodwater			
Crop and Pasture	2,845,800	2,780,700	65,100
Other Agricultural	134,700	131,600	3,100
Non-agricultural			
Road and Bridge	446,500	435,700	10,800
Railroad	172,600	168,500	4,100
Subtotal	3,599,600	3,516,500	83,100

GRAND TOTAL	4,067,200	3,667,900	399,300
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^{a/} Price base: Agricultural production is current normalized (Oct. 1981); all other is current 1981.

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TABLE 6 - COMPARISON OF NED BENEFITS AND COSTS OF STRUCTURAL MEASURES

Middle Creek Watershed, Kansas

(Dollars)^{a/}

Evaluation Unit	Flood Prevention Benefits			Average Annual Costs b/ c/	Benefit Cost Ratio
	Damage Reduction	More Intensive Land Use	Outside Watershed Boundaries		
11 Floodwater Retarding Dams	446,000	126,300	117,200	351,700	2.0:1
GRAND TOTAL	446,000	126,300	117,200	351,700	2.0:1

a/ Price Base 1981. Includes interest and accrued benefits during installation as follows:
 flood prevention, \$163,900; more intensive use, \$35,300.

b/ Includes interest during construction of \$107,500.

c/ From Table 4.

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IMPACTS OF RECOMMENDED PLAN

This section covers impacts of the recommended plan on each of the problems determined to be significant by the scoping process. Impacts are measured in physical and monetary terms if at all possible.

A review of the analysis of impacts, Table B on page 10, shows that the recommended plan will have a major impact on flooding, peak streamflow, and agricultural income. It will have a moderate impact on erosion, land use, prime farmland, fish, wildlife, transportation, a state-listed threatened species, and wildfires. The recommended plan will have minor impacts on ground water, irrigation, water quality, sedimentation, visual resources, and recreation but these factors were not significant to decision making. Rationale for not discussing a factor in this section was given in the Significant Concerns section. Monetary values of benefits and costs are included in Tables 5 and 6, pages 39 and 40. Impacts are also shown in Table A, page 3.

Flooding Related Impacts

Installation of 11 floodwater retarding dams will have a major impact on peak streamflow in the watershed. Frequency, discharge, depth, area, and velocity of flood flows will be reduced.

Table H shows reduction of peak flows with the project and the frequency of bank full flows with and without the project.

Table H - Peak Flow Reductions and Bank Full Frequencies

<u>Reach</u>	<u>Location</u>	<u>Percent ^{a/} Peak Reduction</u>	<u>Bank Full Frequency</u>	
			<u>w/o Project</u>	<u>w/Project</u>
			<u>Time(s)/</u> <u>Year(s)</u>	<u>Time(s)/</u> <u>Year(s)</u>
1	Sec. 1-4 Center Sec. 2-19-7E	52.6	4/1	6/5
3	Sec. 3-2 Center Sec. 13-19-6E	58.8	2/1	1/2
4	Sec. 4-5 NW $\frac{1}{2}$ 5-19-6E	71.5	5/2	1/5
6	Sec. 6-2 NW $\frac{1}{2}$ 8-19-6E	55.7	7/1	3/1
7	Sec. 7-3 Center 11-19-5E	62.4	9/1	1/1
8	Sec. 8-3 Center 15-19-5E	76.1	2/1	1/100
9	Sec. 9-3 NW $\frac{1}{2}$ 10-19-5E	47.2	8/1	3/2
10	Sec. 10-2 SE $\frac{1}{2}$ 2-19-5E	41.3	4/1	3/2
12	Sec. 12-2 SW $\frac{1}{2}$ 26-18-5E	28.2	4/1	3/2
14	Sec. 14-3 NE $\frac{1}{2}$ 15-18-5E	34.6	9/1	5/1

^{a/} Average reductions for storms ranging from 4 inches to 10 inches of rainfall in 24 hours.

The planned project will accomplish a 68 percent reduction in average annual flood damage on 5,139 acres. Flood plain benefited in each reach and the percentage of damage reduction by structural measures is shown in Table I.

Table I - Average Annual Flood Damage Reduction

<u>Evaluation Reach</u>	<u>Flood Plain Benefited a/ (acres)</u>	<u>Damage Reduction (percent)</u>
1	1,910	71
2	189	0
3	1,254	81
4	391	94
6	480	67
7	111	77
8	50	98
9	96	70
10	248	51
12	223	30
14	187	62
Total	5,139	Average 68

a/ 100-year flood plain, excluding channels.

Flood plain residents will have improved living conditions and economic and psychological security due to reduced flooding. Flood damage reduction will indirectly affect most of the 1,060 people in the watershed. All or parts of 48 farm operating units are located in the flood plain and will be directly affected by the project.

More intensive use benefits will stem from a shift from flood-resistant, lower income crops to higher income crops no longer flooded or flooded less frequently once the project is completed. They will also accrue from shorter crop rotations and more timely harvesting and planting dates.

Extremes in streamflow will be reduced. The structures will reduce high-flow peaks while prolonging discharge after storms. Some water will evaporate from impoundments. Water stored in structures will increase ground water recharge in some of the limestone formations. The effect on ground water tables is not expected to be of widespread significance; however, the recharge will increase flow from springs in the vicinity of the structures. Seepage and prolonged discharge from reservoirs will contribute to stream base flows. Overall, the discharge and frequency of low flows is expected to increase. Streams will be dry less often although changes of stream classification are not expected. 38/

Damage reduction benefits to Cottonwood River properties outside the watershed will be approximately 21 percent of the total benefits for the Middle Creek project. Each planned or potential project in the Cottonwood Basin was allocated a share of the total potential benefits identified along the Cottonwood flood plain. Benefit distribution was based on analysis of simulated localized historical storms centered over various parts of the basin. The benefit distribution study was coordinated with the U.S. Corps of Engineers, who was studying potential small watershed structures elsewhere in the basin. (See Relationship to Land and Water Resource Plans, Policies, and Controls.) Benefits of completed projects such as Silver Creek Watershed and Marion Reservoir were not factors in the benefit analysis because the "without project" conditions included their effects.

Erosion Related Impacts

Installation of the recommended structural measures will have a significant impact on the flood plain soil loss. Excessive erosion will be reduced to an acceptable loss on 72 percent of the acres.

The recommended project will have little impact on the upland soil loss. A one-percent reduction in soil loss is expected.

The EQ measures of wildlife habitat improvement and rangeland improvement will add to the ground cover, slowing runoff and improving water intake by soils.

The forest land treatment program will also reduce erosion. Windbreaks and shelterbelts will break up wind and assist in reducing erosion.

Land Use and Prime Farmland Impacts

Table J shows land use in the future with project conditions. Except for land used for structures, flood plain land use will remain about as shown in Table C I, page 11.

Table J - Projected Land Use With Project

	Total	
	% use	acres
Cropland	20.9	15,081
Pastureland	2.2	1,542
Rangeland	71.4	51,580
Woodland	1.4	1,035
Stream channel, ponds	2.9	2,085
Miscellaneous	1.2	888
TOTAL	100.0	72,211

Sediment pool land uses will be changed initially to water surface and eventually sediment. The dam and spillway cropland and woodland acres will be seeded to native grasses and forbs. The 11 planned structures will directly change land use as shown in Table K below.

Table K - Land Use at Structures (Acres)

<u>Project Land Use</u>	<u>Present Land Use</u>				<u>Total</u>
	<u>Crop- land</u>	<u>Grass- land*</u>	<u>Wood- land</u>	<u>Other</u>	
Sediment Pools	2	163	34	0	199
Retarding Pools	21	525	26	4	576
Dams and Spillways	<u>5</u>	<u>48</u>	<u>7</u>	<u>0</u>	<u>60</u>
TOTAL	28	736	67	4	835

*Mostly rangeland

At maximum flood detention 775 acres will be covered by flood-water retarding pools. Individual pools will be filled an average of once every 25 years or less frequently.

Reduced flooding on 1,470 acres will result in their being classed as prime farmland. Structures will occupy 47 acres of existing prime farmland. A net increase of 1,423 acres of prime farmland will result. Additionally, 2,943 acres of existing prime farmland will benefit from reduced flooding.

Fish and Wildlife Impacts

Wildlife habitat management and rangeland practices will add to the value of woodland and rangeland habitat.

Management of rangeland to obtain good or better condition benefits fish (see other impacts) and wildlife as well as livestock. The diversity of grasses and forbs is greatest on good condition range. This diversity improves the habitat for wildlife. The use of specialized grazing systems or the use of frequent late-season rest along with proper use can restore and maintain the rangelands in good condition. Grazing management or exclusion that maintains a diverse understory in bottomland woodland improves it for wildlife associated with the woodland/rangeland/cropland edge.

Wildlife habitat diversity will improve with proper grazing management and related increase of woodland understory. Use of woodland for winter feeding areas for livestock will be foregone for the associated increase in woodland understory and grass. Development of other winter feeding areas in combination with increased production from lowland range sites should provide increased livestock management and wildlife habitat benefits to producers.

Sponsors will compensate terrestrial wildlife habitat losses caused by structures. Wildlife habitat changes induced by project

structures are summarized in Table L and shown in detail in Table I, Appendix D. Table II, Appendix D, shows expected terrestrial habitat losses that would have occurred without compensation.

Table L - Impact on Wildlife Habitat at Structure Sites 23/

<u>Habitat Type</u>	<u>Habitat Value a/</u>		
	<u>Construction</u>	<u>Compensation</u>	<u>Net Change</u>
Woodland	249	249	0
Herbaceous	1,131	582	-549

a/ Value listed in habitat units. Habitat units equal rated quality value (1 to 10) multiplied by acres.

Threatened or Endangered Species Impacts

The only threatened or endangered species in Middle Creek Watershed is the state-listed Topeka shiner. Adverse impacts on the species will be mitigated as necessary to secure the required permit from the Kansas Fish and Game Commission.

Mineral Resource Impacts

Because of the small size of the planned structures compared to the large areas suitable for oil and gas wells and rock quarries, the structures will not affect mineral extraction.

Other Impacts

The project will improve downstream water quality by the impoundment of sediment, other solids and adsorbed chemicals. This will reduce the effects of slug concentrations of nutrients, bacteria, sediment and suspended solids during floods. Biological oxygen demand and bacterial densities will be decreased. Water temperatures will not be significantly changed.

Storm runoff will increase concentrations of suspended sediment, nutrients, bacteria, biocides, and other suspended particles in reservoirs. Most of these materials will settle within one week.

Use of sediment pools for recreation will not be competitive with recreation projects in the area. Some use by local residents for fishing is expected but is not believed to be of major impact.

Mosquito breeding areas will be decreased because less flood plain area will be flooded.

Relationship to Land and Water Resource Plans, Policies and Controls

Nearby projects of other agencies include Chase State Fishing Lake 2 miles west of Cottonwood Falls and four Corps of Engineers projects: Council Grove Reservoir in Morris County, John Redmond Reservoir located 30 miles southeast of the watershed, Milford Reservoir located 50 miles north, and Marion Reservoir, upstream on the Cottonwood River.

Other projects in the Cottonwood River basin include: Diamond Creek Watershed, Peyton Creek Watershed, and South Fork Watershed (all in planning); Silver Creek Watershed (construction completed); Jacobs-Phenis Creeks Watershed (a Resource Conservation and Development [RC&D] measure in planning); and Doyle Creek Watershed (application approved).

In December 1979, the Corps of Engineers, Tulsa District, published a report 44/ providing information on potential locations for small dams for future use in water resource development in the Grand and Cottonwood River Watersheds above John Redmond Reservoir. Middle Creek, Diamond Creek, Peyton Creek, Silver Creek, Eagle Creek, and South Fork Watersheds were not included in the Corps study.

CONSULTATION AND PUBLIC PARTICIPATION

Chase County, Marion County, and Morris County Conservation Districts asked SCS to make a feasibility study of Middle Creek Watershed and Diamond Creek Watershed and helped organize a steering committee in 1959. A field tour and public meeting were conducted November 3 and 4, 1959. A preliminary feasibility report was presented at the public meeting. The Middle Creek Watershed District was later organized according to Kansas State Statutes of incorporation on February 3, 1964.

Middle Creek Watershed Joint District No. 62 and other sponsors submitted a watershed application to SCS on January 4, 1965. This application was filed with the Governor's Watershed Review Committee later in 1965. A field examination team and other interested individuals toured the watershed, identified watershed problems, and recommended solutions. The field examination team was composed of representatives from the State Conservation Commission; Kansas Water Resources Board; Kansas Board of Agriculture, Division of Water Resources; SCS; Forest Service; and Kansas Extension Service. A public meeting was held April 20, 1965 at the Burdick grade school, and 118 individuals attended. A Field Examination Report was prepared summarizing the team's findings and recommendations. The State approved the watershed application on May 3, 1965. A priority was assigned by the Kansas Watershed Review Committee August 4, 1969.

Initial planning results were presented to sponsors in a Preliminary Watershed Investigation Report dated June, 1970. The Administrator of SCS approved planning assistance on May 24, 1971.

On December 16, 1971, after a series of meetings and solicitations of public input, the sponsors formulated a tentative system of structural measures for their General Plan. The Watershed District asked SCS to determine those sites that would be eligible for P.L. 566 financial assistance. Fifteen were estimated feasible for P.L. 566 assistance in September, 1972.

Timely progress toward completion of planning was interrupted by a reduction in SCS planning personnel coupled with additional requirements of the National Environmental Policy Act and the Water Resources Council's Principles and Standards. The Cottonwood-Neosho River Watersheds Committee was formed in September of 1975 to support watershed development at state and national government levels.

A public meeting was held in late 1978 to review project objectives. Objectives were broadened to include other national, environmental, special interest group, and sponsor objectives. An environmental assessment was made of the watershed. All identified land and water problems were considered. An interdisciplinary team assisted sponsors to formulate an environmental quality plan that would most nearly satisfy national environmental objectives.

A public meeting was held on September 4, 1980, to discuss the environmental assessment, national economic and environmental objectives, national economic development plan, environmental quality plan; and to answer questions and solicit ideas from the public. After the meeting the public was further invited to help formulate a plan.

See the Formulation Process, pages 15 and 16 for more information about the planning process.

Conservation districts have an active role as sponsors of the proposed watershed program. News media, business people, and others are backing the project. Residents and landowners in the watershed have had substantial opportunity to participate in formulating project objectives and alternative actions.

Since formal incorporation of the Middle Creek Watershed Joint District No. 62, the district board has carried out a continuing program to inform and involve the general public. Some activities of this program are listed on the following page:

1. Quarterly or on-call meetings open to the public have been held. Specialists have usually been available to discuss watershed problems and planning needs.
2. Annual meetings, advertised in advance in the principal county newspapers, have been held.
3. Meetings have been held as necessary between watershed board representatives and officials of city, townships, county and state governments, and other sponsors.
4. Frequent personal contacts have been made between watershed directors and individual farmers to explain the program.

A team of biologists investigated proposed structure sites in the watershed to evaluate wildlife habitat and estimate changes. 31/ An interdisciplinary team discussed the habitat changes and recommended full compensation for woody habitat losses to the State Conservationist. 23/ The SCS and the sponsors worked together to determine the maximum habitat replacement consistent with sponsor capabilities to provide land rights, and operation and maintenance. The watershed district board agreed to the compensation measures presented in this plan/EIS.

The U.S. Fish and Wildlife Service and the Kansas Fish and Game Commission participated in the habitat evaluation and in threatened and endangered species determinations.

A Forestry Work Plan 10/ was developed by the State and Extension Forester, Kansas State University, and the Forest Service, and its features are included in the recommended plan.

The Kansas State Historical Society surveyed archeological, architectural, and historical resources in the watershed and found none which will be affected by the proposed project. 12/ 14/

A public meeting was held on October 8, 1981, to discuss the draft plan and environmental impact statement. A question and answer session was part of the meeting. Questions dealt primarily with land rights.

The following agencies, conservation groups, and organizations were asked to comment on the draft plan and environmental impact statement:

- *Department of the Army
- Department of Commerce
- *Department of Health and Human Services
- *Department of Housing and Urban Development

- Federal Energy Regulatory Commission
- Friends of the Earth
- *Governor of Kansas
- Kansas State Historical Society
- Kansas Water Office

*Department of the Interior	National Audubon Society
Department of Transportation	National Wildlife Federation
Division of Budget (State	Natural Resources Defense
Clearinghouse)	Council
Environmental Defense Fund	*Office of Minority Affairs, USDA
*Environmental Protection Agency	

*Comments were received from these agencies.

See Appendix B for letters of comment received.

Comments received from the following agencies either provided concurrence or did not raise environmental issues: Department of the Army, Department of Housing and Urban Development, Department of the Interior, Environmental Protection Agency, Governor of Kansas, and Office of Minority Affairs, USDA.

Each substantive comment raising an environmental issue, problem, or objection during interagency review is presented and discussed in Appendix B.

LIST OF PREPARERS
MIDDLE CREEK WATERSHED
WORK PLAN AND ENVIRONMENTAL IMPACT STATEMENT

FORMAT:

NAME - Present Job Title (years); Degree(s) - Major; continuing education subjects; Former Job Titles (years of experience); other information.

INTERDISCIPLINARY TEAM:

LEE COLLINSWORTH - SCS Chase Co. Dist. Conservationist (30); BS-Agric. Econ.; environ. quality.

JESSE CROCKFORD - SCS Morris Co. Dist. Conservationist (3); BS-Forestry, Range; Dist. Conserv. (2); Range Conserv. (2), Range Tech. (3 mos.), Forestry Tech. (1).

CLIFTON E. DEAL - SCS Civil Engineer (4); BS-Geol. Engr.; various courses in soil mech. and dam design, water quality training, Masters thesis research, environ. sem.; Civil Engr. (8), Constr. Engr. (3), Proj. Engr. (1), Soil Mech. Engr. (5).

W. DUANE EVANS - SCS Agric. Economist (15); BS-Agric. Econ., MS-Agric. Econ.; statistics, linear programming, computer sci., environ. sem.

H. LYNN GIBSON - SCS State Range Conservationist (5); BS-Range; ecosystems mgt., environ. develop.; Range Conserv. (5), Dist. Conserv. (4); Area Range Conserv. (2).

RICHARD HAGER - SCS State Biologist (5); BS-Bot. (Biol.), MS-Bot. (Ecol.); fisheries, habitat analysis, environ. development, limnology; Area Biol. (5), Soil Conserv. (3), Conserv. Tech. (1), Student Trainee Biol. (2), Certified Wildlife Biol. T.W.S.

DILLARD HUFFAKER - SCS Area Conservationist (2); BS-Animal Husbandry; RC&D Coordinator (7½), Dist. Conserv. (13½), Soil Conserv. (5), On-Farm Veterans Training Instructor (4½).

PAUL KOEGEBOEHN - Farmer (52); Chase County Conservation District Board (28), RC&D Board (7); State Association of Kansas Watersheds (6), County Commissioner (4), Middle Creek Watershed President (15).

JAMES M. LUTEY - F&WS Asst. Area Manager-Environment (1); BS-Wildlife Mgmt.; Hatchery Mgr. (7); F&WS Biol. (7).

KIRK MILES - SCS Agric. Economist (4); BS-Agric. Econ.; computer sci., environmental concepts sem.; Soil Conserv. (1/2).

LARRY D. MILES - SCS Water Resources Planning Engineer (10); BS-Civil Engr.; computer technol., engrng. properties of soils, Constr. Engr. (2), Design Engr. (5); Registered Prof. Engr. Kansas License No. 5846.

LAWRENCE N. NIEMAN - SCS Asst. State Conservationist for Water Resources S. Dak. (1); BS-Bus. Mgmt., MS-Publ. Admin.; Range Conserv. (4), Dist. Conserv. (5), Resource Conserv. (2), Area Conserv. (2).

RICHARD R. RAINES - F&WS Senior Staff Biologist (3); BS-Biol., MS-Biol.; computer programming, Engl. comp., environ. educ.; Park Ranger (2), Environmentalist (2), Fish and Wildlife Biol. (3).

JOHN W. REH - SCS Water Resources Planning Staff Leader (11); BS-Agric. Engr.; computer sci., water resource engrng., wildlife mgt., environ. assessments and statements, multiobjective planning; Hydrol. Engr. (10); Design Engr. (2), Proj. Engr. (2); Registered Prof. Engr. Kansas License No. 5023.

LONNIE L. SCHULZE - SCS Resource Conservationist (2); BS-Agric.; Range Conserv. (3), Dist. Conserv. (9), Range Conserv. (3).

HAROLD KIP WELLS - Middle Creek Watershed President (1), Farmer (6), Attorney (27); BA-Law, LLB-Law, JD-Law; Dept. of Interior, Alaska Pipeline (2).

LAWRENCE H. WETTER - SCS Hydraul. Engineer (7); BS-Agric. Engr., MS-Civil Engr. (Hydrol.); hydrometeorology, dam break/breach routing, analysis of watersheds and river systems; SCS Area Agric. Engr. (2), Hydraul. Research Asst. (2), County Engr. (roads, bridges) (3), SCS Civil Engr. (proj. constr., dams) (7). Registered Prof. Engr. Kansas License No. 5325.

ROSE WHINERY - SCC Tech. Writer (3); BA-Engl.; linguistics, journ., environ. educ., Amer. environ.; Asst. Instructor (2), Copy Editor (2), Instructor (2), Editor (1); Kansas Secondary Teaching Certificate.

ROBERT D. WOOD - KFGC Eviron. Liaison Biologist (9); BS-Wildlife Mgt.; KFGC Game Biol. (10); Certified Wildlife Biol. T.W.S.

The preparers of this document include various consultants and SCS specialists in addition to the members of the Interdisciplinary Team and the Triagency Team.

Reservoir topographic maps were made by Bucher and Willis Engineers, Burgwin and Martin Engineers, and Casper Engineering. Delamater and Associates provided project maps. Wilson and Co. Engineers performed preliminary design and drafting. Cook, Flatt and Strobel Engineers made hydraulic studies and bench mark surveys. Van Doren, Hazard and Stallings Engineers did hydraulic studies and mapping. Geologic investigations were made by Wichita Testing Laboratory. Biologists from Emporia State University made assessment of threatened and endangered species, including present status and projected impacts.

The draft watershed plan and environmental impact statement was reviewed by Soil Conservation Service state staff specialists having responsibility for engineering, soils, agronomy, range conservation, biology, forestry, geology, hydrology, and economics. This review was followed by a review of the document and supporting data by the Midwest Technical Service Center.

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Appendix A - Display of Accounts for Recommended Plan

Appendix B - Letters of Comment

Appendix C - Summary of Comparison of Alternative Plans

Appendix D - Miscellaneous Data (Tables I and II)

Appendix E - Maps

A P P E N D I X A

Display Accounts for Recommended Alternative

National Economic Development

Environmental Quality

Regional Economic Development

Other Social Effects

RECOMMENDED PLAN

NATIONAL ECONOMIC DEVELOPMENT

MIDDLE CREEK WATERSHED, KANSAS

<u>Components</u>		<u>Measures of effects (average annual dollars)</u>	<u>Components</u>	<u>Measures of effects (average annual dollars)^{b/}</u>
Beneficial effects			Adverse effects	
A. The value to users of increased outputs of goods and services			A. The value of resources required for a plan	
			1. Project installation ^{a/}	324,100
Flood Prevention ^{c/}		689,500	Operation and maintenance	24,500
			2. Project administration ^{a/}	52,600
Total beneficial effects		689,500 ^{d/}	Total adverse effects	401,200 ^{e/}
			Net beneficial effects	288,300

a/ Amortized at 7 5/8 percent interest rate for 100 years.

b/ Price Base: 1981

c/ Price Base: Current normalized for crop and pasture and flood plain scour, WRC October 1981. Other items 1981 prices.

d/ Land treatment beneficial effects were not evaluated by dollars.

e/ Land treatment costs of \$49,500 are included.

August 1982

RECOMMENDED PLAN
ENVIRONMENTAL QUALITY
MIDDLE CREEK WATERSHED, KANSAS

<u>Components</u>	<u>Measures of effects</u>
Beneficial and adverse effects	
A. Areas of natural beauty	<ol style="list-style-type: none">1. Improve appearance of woodland and rangeland through additional plantings, farm ponds, better management, and fire control.2. Increase landscape diversity by creation of 11 lakes averaging 18 acres each.3. Inundate 199 acres of land, 4.8 miles of intermittent and 4.9 miles of ephemeral streams.
B. Quality considerations of water, land, and air resources	<ol style="list-style-type: none">1. Reduce the total sediment load at the mouth of Middle Creek by 12 percent.2. Reduce scour by 72 percent on the flood plain.3. Control flood runoff from 29 percent of the watershed to reduce flood plain damage by 68 percent and decrease average peak flood flow by 51 percent at the watershed outlet.4. Temporarily increase erosion, air and water pollution during construction.

August 1982

RECOMMENDED PLAN

ENVIRONMENTAL QUALITY
(continued)

MIDDLE CREEK WATERSHED, KANSAS

<u>Components</u>	<u>Measures of effects</u>
C. Biological resources and selected ecosystems	<ol style="list-style-type: none">1. Improve the value of 119 acres of tributary riparian woodland for wildlife.2. Improve the value of 7,570 acres of rangeland for wildlife.3. Inundate 4.8 miles of intermittent stream, 4.9 miles of ephemeral stream, and 199 acres of terrestrial habitat.4. Cause a net loss of 541 units of herbaceous habitat.
D. Irreversible or irretrievable commitments	<ol style="list-style-type: none">1. Permanently inundate 199 acres, 418 miles of intermittent stream and 4.9 miles of ephemeral stream.2. Occasionally flood 576 acres in floodwater retarding pools.3. Construct dams and spillways on 60 acres.

August 1982

RECOMMENDED PLAN

REGIONAL ECONOMIC DEVELOPMENT

MIDDLE CREEK WATERSHED, KANSAS

Components	Measures of effects (average annual dollars)		Measures of effects (average annual dollars) ^{b/}	
	State of Kansas	Rest of Nation	State of Kansas	Rest of Nation
Income				
Beneficial effects				
A. The value of increased output of goods and services to users residing in the region				
1. Flood prevention		0		
2. Additional wages and salaries accruing to the region from implementation of the plan and project operation and maintenance	\$689,500 ^{c/}		\$ 53,000 24,500	\$271,100 0
			700	51,900
Adverse effects				
A. The value of resources contributed from within the region to achieve the outputs				
1. 11 floodwater retarding dams				
Project installation ^{a/}				
Operation and maintenance				
2. Project administration ^{a/}				
B. Losses of output resulting from external diseconomies to users residing in the region	4,500	- 4,500		
1. Indirect activities reservoir take area			14,500	- 14,500
	128,500	-128,500		
Total beneficial effects	822,500	-133,000	92,700	308,500
Net beneficial effects			729,800	441,500
Total adverse effects				
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RECOMMENDED PLAN

REGIONAL ECONOMIC DEVELOPMENT (continued)

MIDDLE CREEK WATERSHED, KANSAS

<u>Components</u>		<u>Measures of effects</u>		<u>Measures of effects</u>	
<u>Employment</u>	<u>Beneficial effects</u>	<u>State of Kansas</u>	<u>Rest of Nation</u>	<u>State of Kansas</u>	<u>Rest of Nation</u>
		(none)	(none)	(none)	(none)
A. Increase in the number and types of jobs		A. Decrease in number and types of jobs			
1. Agricultural employment	12.4 man-years annually	1. Lost agricultural employment	0.8 man-year annual employment		
2. Employment for project construction	80.3 man-years employment during installation	2. Lost in indirect and induced employment associated with project take area	0.3 permanent jobs		
3. Employment for project operation and maintenance	0.3 permanent jobs	Total adverse effects	1.1 permanent jobs		
4. Indirect and induced employment for project installation and output of project's goods and services	5.0 permanent jobs	Net beneficial effects	16.6 permanent jobs		
Total beneficial effects	17.7 permanent jobs			80.3 man-years employment during installation	

August 1982

RECOMMENDED PLAN

REGIONAL ECONOMIC DEVELOPMENT (continued)

MIDDLE CREEK WATERSHED, KANSAS

<u>Components</u>	<u>Measures of effects</u>	
	<u>State of Kansas</u>	<u>Rest of Nation</u>
Population distribution		
Beneficial effects	Creates 16.6 permanent jobs and 80.3 man-years employment during installation	-
Adverse effects	-	-
Regional economic base and stability		
Beneficial effects	Creates 16.6 permanent jobs and 80.3 man-years employment in an area where 16.0 ^{a/} percent of the families have incomes less than the national poverty level (\$5,000)	-

a/ 1970 county and city data

August 1982

RECOMMENDED PLAN

OTHER SOCIAL EFFECTS

MIDDLE CREEK WATERSHED, KANSAS

<u>Components</u>	<u>Measures of effects</u>												
Beneficial and adverse effects													
A. Real income distribution	<div>1. Create 16.6 low to medium income permanent jobs for area residents</div> <div>2. Create regional income benefits of \$822,500 distributed by income class as follows:</div> <table><tr><th><u>Income Class</u> <u>(dollars)</u></th><th><u>Percentage of</u> <u>Adjusted Gross</u> <u>Income in Class</u></th><th><u>Percentage</u> <u>Benefits</u> <u>in Class</u></th></tr><tr><td>Less than 7,000</td><td>16</td><td>16</td></tr><tr><td>7,000 - 23,000</td><td>63</td><td>63</td></tr><tr><td>More than 23,000</td><td>21</td><td>21</td></tr></table> <div>3. Local costs to be borne by region total \$92,700 with distribution by income class as shown above.</div>	<u>Income Class</u> <u>(dollars)</u>	<u>Percentage of</u> <u>Adjusted Gross</u> <u>Income in Class</u>	<u>Percentage</u> <u>Benefits</u> <u>in Class</u>	Less than 7,000	16	16	7,000 - 23,000	63	63	More than 23,000	21	21
<u>Income Class</u> <u>(dollars)</u>	<u>Percentage of</u> <u>Adjusted Gross</u> <u>Income in Class</u>	<u>Percentage</u> <u>Benefits</u> <u>in Class</u>											
Less than 7,000	16	16											
7,000 - 23,000	63	63											
More than 23,000	21	21											
B. Life, health, and safety	<div>1. Provide 67.7 percent floodwater damage reduction.</div> <div>2. Net increase of prime farmland by 1,423 acres. Reduced flooding on 2,943 acres of prime farmland.</div>												

August 1982

A P P E N D I X B

Letters of Comment



OFFICE OF THE GOVERNOR

State Capitol
Topeka 66612

John W. Tippie

March 29, 1982

John W. Tippie
State Conservationist
U.S. Soil Conservation Service
Post Office Box 600
Salina, Kansas 67401

Dear Mr. Tippie:

In reply to your request of January 29, 1982, we submit the following comments on the Water Shed Plan and Environmental Impact Statement on Middle Creek Watershed. Comments are on behalf of the State of Kansas and are based on a review by the Kansas Water Office with cooperation from interested state agencies. The purpose of the review was to comply with the Federal Office of Management Circular A-95 and to develop the State's position on the proposed plan.

The Kansas Water Office advises that flooding and erosion constitutes a serious economic problem in the watershed study area, and that the recommended plan of improvement is the most desirable of all solutions studied. Middle Creek Watershed Joint District No. 62, Chase County Conservation, Marion County Conservation District, and Morris County Conservation District, as local sponsors, have expressed their willingness to assume local responsibilities associated with the project. Comments received by the Kansas Water Office during the review of this project have been supportive of the recommended plan.

It should be noted that under provisions of Kansas Law approval of specific projects in the plan are required by the Chief Engineer, Division of Water Resources, Kansas State Board of Agriculture and are required prior to initiation of project construction. The project, as set forth in your report, conforms to the general provisions of the State Water Plan and is also in accordance with general state water policies.

John W. Tippie
March 29, 1982
Page Two

In view of the foregoing, we concur in the views expressed by the Kansas Water Office and urge that the proposed plan be implemented at the earliest possible date.

Sincerely,

JOAN CARLIN
Governor

JC:DM:kmg

cc: Kansas Water Office
Division of Water Resources, State Board of Agriculture
Middle Creek Watershed Joint District No. 62
A-95 Clearinghouse

No response necessary



DEPARTMENT OF THE ARMY
OFFICE OF THE ASSISTANT SECRETARY
WASHINGTON, D.C. 20310

23 MAR 1982

Mr. John W. Tippie
State Conservationist
Box 600
Salina, Kansas 67401

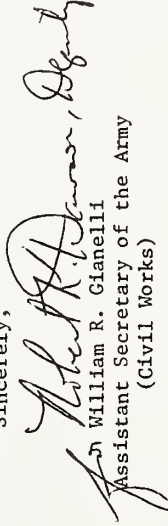
Dear Mr. Tippie:

This is in response to your letter of January 29, 1982, to the Chief of Engineers, Department of the Army, requesting comments on the draft watershed plan and environmental impact statement for the Middle Creek Watershed, Kansas.

[In view of the current budgetary constraints and the Administration's concern that beneficiaries, to the extent they can be identified, should pay for services received, you may wish to consider deviating from traditional cost sharing arrangements for this type of project. We have no comments to offer on this specific report.]

Thank you for the opportunity to review your report.

Sincerely,


for William R. Cianelli
Assistant Secretary of the Army
(Civil Works)

Public Law 566 specifies 100 percent federal financial and technical assistance for construction of structural flood prevention measures. The law also specifically provides 100 percent federal technical assistance for watershed protection (accelerated land treatment). No opportunity for deviation occurs in this proposed plan.



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION VII
324 EAST ELEVENTH STREET
KANSAS CITY, MISSOURI - 64106

March 15, 1982

Mr. John W. Tippie
State Conservationist
Soil Conservation Service
P.O. Box 600
Salina, Kansas 67401

Dear Mr. Tippie:

Middle Creek Watershed
Chase, Marion, and Morris Counties, Kansas

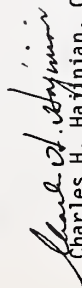
We have reviewed the Draft Watershed Plan and Environmental Impact Statement (EIS) for the project identified above. The proposed project and draft EIS have been rated LO-1, respectively. This rating means we have a lack of objections to the project as proposed and find the document adequate.

No response necessary

If project purposes are changed to include water supply storage, we would appreciate being notified of such change and being given the opportunity to review the project for water quality impacts.

Thank you for the opportunity to review and comment on this Plan and draft EIS. Please provide us with three copies of the final environmental impact statement.

Sincerely yours,


Charles H. Hoffman, Chief
Environmental Review Branch



U.S. Department of Housing and Urban Development
Office of the Area Manager

In Reply Refer to: 7.1SS:11

Area Office
Professional Building
1103 Grand
Kansas City, Missouri 64106

March 8, 1982

Mr. John W. Tippie
State Conservationist
U.S. Department of Agriculture, SCS
Box 600
Salina, Kansas 67401

Dear Mr. Tippie:

Subject: Draft Environmental Impact Statements
(1) Diamond Creek Watershed
(2) Middle Creek Watershed
Chase and Morris Counties, Kansas

This letter is in response to your request for comments in accordance with Section 102 (2)(c), Public Law 91-190, regarding the subject Draft Environmental Impact Statements. Please be advised that this office has reviewed the subject matter and found no apparent significant environmental impact on any HUD projects within our jurisdiction.

No response necessary

Sincerely,

Lance Long
Lance Long
Environmental Officer



United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

ER-82/282

MAR 23 1982

Mr. John W. Tippie
State Conservationist
Soil Conservation Service
Box 600
Salina, Kansas 67401

Dear Mr. Tippie:

Thank you for the letter of January 29, 1982, requesting our views and comments on the draft watershed plan and draft environmental impact statement (EIS) for Middle Creek Watershed, Chase, Marion, and Morris Counties, Kansas.

Based on our jurisdiction and expertise, the draft EIS adequately describes the impacts of the proposal.

Our review of the plan did not surface any conflicts with programs or missions of this Department. Therefore, we have no objection to its findings and recommendations.

Sincerely,

Bruce Blanchard, Director
Environmental Project Review

No response necessary



United States
Department of
Agriculture

Office of
the Secretary

Office of
Minority Affairs

Washington, D.C.
20250

SUBJECT: Draft Watershed Plan/Environmental Impact Statement
for the Middle Creek Watershed, Kansas FEB 17 1982

TO: John W. Tippie
State Conservationist

THRU: David Montoya *DWM*
Equal Opportunity and Civil Rights
Soil Conservation Service

We have reviewed the Soil Conservation Service Draft Watershed Plan/Environmental Impact Statement (EIS) for the Middle Creek Watershed, Kansas. The purpose of our review was to assess the impact, if any, your proposed project will have on minorities residing in or near the watershed.

No response necessary

Your draft plan/EIS indicates on page 5, under the section entitled, Project Setting, that there are no identifiable minority or disadvantaged groups in the watershed. Hence, it appears that your proposed project will have no significant civil rights impact.

Thank you for this opportunity to review and comment on your draft plan/EIS.

J. A. Muanda
DORIS C. THOMPSON
Acting Director

Centers for Disease Control
Atlanta, Georgia 30333
(404) 262-6649

March 24, 1982

Mr. John W. Tippie
State Conservationist
U. S. Department of Agriculture
Soil Conservation Service
Box 600
Salina, Kansas 67401

Dear Mr. Tippie:

We have reviewed the Draft Watershed Plan and Environmental Impact Statement (EIS) for Middle Creek Watershed, Chase, Marion, and Morris Counties, Kansas. We are responding on behalf of the Public Health Service.

We do not believe that the EIS adequately addresses a number of issues that will impact on the health, safety, and well-being of watershed residents.

The EIS does not address mosquito or other vector populations. Since there is potential for mosquito breeding in the water retention areas, the Final EIS should discuss beneficial or adverse effects of this project on mosquito or other vector populations, their potential health threats, proposed or current control methods that may be used, kinds and volumes of pesticides that may be used, and anticipated application procedures.

The EIS states that brush control will be by mowing, cutting, burning, and spraying. The Final EIS should describe the brush control spray measures anticipated, the methods of chemical application, the types of herbicides to be used, and other related aspects of the control program.

It is our understanding that none of the watershed is classed as wetland and, therefore, the provisions of Executive Order 11990, Protection of Wetlands, is not applicable. However, the Final EIS should contain a statement as to whether or not the project will meet the provisions of Executive Order 11988, Floodplain Management.

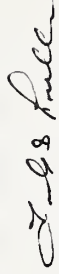
Since some of the land in this watershed is classed as prime farmland, the Final EIS should clarify whether or not the project conforms to the Council on Environmental Quality's and the Department of Agriculture's joint memorandum of August 30, 1976, concerning prime and unique farmland.

The Final EIS should also describe the controls that will be imposed in this watershed to ensure that no future development occurs in this floodplain.

Page 2 - Mr. John W. Tippie

Thank you for the opportunity to review this EIS. Please send us a copy of the Final EIS when it becomes available. If you should have any questions about our comments, please contact Mr. Lee Tate of my staff at FTS 236-6649.

Sincerely yours,



Frank S. Lisella, Ph.D.
Chief, Environmental Affairs Group
Environmental Health Services Division
Center for Environmental Health

1 We have added a statement on page 45 explaining that the project will reduce mosquito breeding grounds. The statement on page 33 is also clarified to identify mosquitoes and other disease carriers.

2 This plan element consists of accelerated technical assistance to an ongoing program. We have added a sentence stipulating compliance with state pesticide and air pollution controls.

3 The primary purpose of this proposed plan is to reduce flood damage in this rural agricultural watershed. This objective coincides with that of Executive Order 11988.

4 The responsibility of SCS regarding prime farmland has been met. Please refer to page 44 where the beneficial effect on prime farmland is discussed.

5 This is rural farm and ranch land. Development for other use is not expected. SCS provides flood hazard data on project areas to local governing bodies for their use in flood plain management.

State Conservationist
Soil Conservation Service
P.O.Box. 600, 760 S. Broadway
Salina, Kansas 67401

Dear:

Thank you very much for sending me the Draft E.I.S. on the Middle Creek Watershed Plan in Chase, Marion, and Morris counties in Kansas and the Final E.I.S. on the Middle Creek Watershed Plan in Miami and Linn counties, Kansas.

Looking into your Draft E.I.S. on the Middle Creek Watershed Plan in Chase, Marion, and Morris counties, I found that the area has been damaged by flood and it is the most serious problem that the watershed area confronts. Then, I would like to express my opinion on your Draft E.I.S.

The main purpose of your proposed plan seems to be to reduce flood damages and to increase agricultural farm income. five alternatives were assessed in the decision-making process. At this stage, you used cost-benefit analysis. But, it is only applied to the comparison between the costs which contain installation, maintenance, and operation of the dams and the benefits which are mainly the agricultural farm increase due to the flood damage decrease. There is no comparison of the trade-off between the agricultural farm increase and the permanent loss of terrestrial wildlife habitat.

You only listed nearby projects of other agencies and didn't discuss how the proposed action may conform or conflict with the objectives and specific terms of approved or proposed Federal, State, and local land use plans, policies, and controls.

The recommended plan assessed flooding, streamflow, and agricultural income as major impacts to increase agricultural income. It has a moderate impact on erosion, sedimentation, land use,

prime farmland, fish, wildlife, transportation, and a state-listed threatened species (Topeka shiner). After comparing the degree of each impacted factor and the costs and the benefits of agricultural income, you determined the recommended plan is the most suitable for the situation. In evaluating the impact, you regard the agricultural increase as of great importance, because the farmers can substitute more profitable crops for less profitable crops which are flood-tolerant.

It is my opinion that the total length of describing adverse impacts are too short (pp. 42-3). In measuring the loss of wildlife habitats, you used habitat units which equal rated quality value (1 to 10) multiplied by acres. But, you did not mention the impacts due to the difference of the location between the losing area and the planning area for compensation. So I think it is necessary that you should address what the criteria in measuring the rated quality are and should compare the difference of rated quality values between the losing area and the planning area for compensation.

There are not enough explanation to figure out threatened or endangered species impacts and other impacts. It is not enough to explain the mitigation of the adverse impacts on the state-listed endangered species (Topeka shiner) only by securing the required permit from the Kansas Fish and Game Commission. It would be better for you to describe what the criteria are in obtaining the required permit.

You mentioned most of the suspended sediment, nutrients, bacteria, biocides, and other suspended particles in reservoirs will settle within one week. It is necessary for you to explain the reason (p. 43).

In describing the effects of the proposed plan, there is no mention about the relationship between the surface water and the groundwater.

The project map identifies the location of eleven detention dams. I think it would be better if you delineate the affected areas of the breach accident to predict the hazard to life and property associated with the uncommon or catastrophic flood event.

Yours Sincerely,

Kyoo-seock Lee

Mr. Lee, a landscape architecture student at the University of Illinois, prepared this letter as a class assignment. We appreciate these comments. We have elected not to answer them specifically, however, because they do not raise new substantive issues but rather express opinion regarding the detail devoted to various topics.

A P P E N D I X C

Summary Comparison of
Alternative Plans

SUMMARY COMPARISON OF ALTERNATIVE PLANS

MIDDLE CREEK WATERSHED, KANSAS

<u>ACCOUNT</u>	<u>RECOMMENDED PLAN</u>	<u>NED PLAN</u>	<u>E.Q. PLAN</u>
<u>National Economic Development</u>			
Income (dollars):			
Beneficial effects	\$689,500 ^{a/}	\$689,500	a/ \$49,500
Adverse effects	401,200	351,700	
Net beneficial effects	288,300	337,800	a/
<u>Environmental Quality</u>			
Beneficial and adverse			
A. Areas of natural beauty			
Increase landscape diversity with water in sediment pools - no. of lakes	11	11	0
B. Quality considerations of water, land, and air resources			
Total sediment yield to Cottonwood River - tons/year	20,300	20,300	23,000

SUMMARY COMPARISON OF ALTERNATIVE PLANS
(continued)

<u>ACCOUNT</u>	<u>RECOMMENDED PLAN</u>	<u>NED PLAN</u>	<u>E.Q. PLAN</u>
<u>Environmental Quality</u>			
Reduce erosion from significant sediment source areas (8-15 tons/acre) - acres	210	210	0
Reduce erosion on moderate sediment source areas (4-8 tons/acre) - acres	10	10	0
Flood plain scour reduction on 468 acres - percent	72	72	0
C. Biological resources & selected ecosystems			
Designated terrestrial wildlife habitat - acres	152	33	119
Convert terrestrial wildlife habitat to aquatic habitat - acres	199	199	0
Convert intermittent stream to permanent water - miles	4.8	4.8	0
Convert ephemeral stream to permanent water - miles	4.9	4.9	0

SUMMARY COMPARISON OF ALTERNATIVE PLANS
(continued)

<u>ACCOUNT</u>	<u>RECOMMENDED PLAN</u>	<u>NED PLAN</u>	<u>E.Q. PLAN</u>
<u>Regional Economic Development</u> <u>State of Kansas</u>			
A. Income (Dollars):			
Beneficial effects	\$822,500	\$822,500	a/ \$42,100
Adverse effects	92,700	50,600	a/ 771,900
Net beneficial effects	729,800		
B. Employment:			
Project construction (man-years)	88.7	80.3	8.4
Project operation and maintenance (man-years)	.6	.3	.3
Agricultural (man-years)	12.4	12.4	0
Indirect from project construction (man-years)	5.0	5.0	0
<u>Other Social Effects</u>			
Beneficial and adverse effects			
A. Real income distribution			
1. Create a net increase of low to medium in- come permanent jobs for area residents (man-years)	16.9	16.6	.3

SUMMARY COMPARISON OF ALTERNATIVE PLANS
(continued)

<u>ACCOUNT</u>	<u>RECOMMENDED PLAN</u>	<u>NED PLAN</u>	<u>E.Q. PLAN</u>
2. Create regional income benefits - (dollars) (distributed as shown for selected alternative in the Social Well-Being Account)	\$822,500 ^{a/}	\$822,500	a/
3. Local costs to be borne by region (dollars) (distributed same as regional income benefits)	92,700	50,600	\$42,100
B. Life, Health, & Safety			
Provide flood protection to flood plain land - percent damage reduction	67.7 ^{a/}	67.7	a/
Increase prime farmland - acres	1,423	1,423	0

a/ Economic effects of E.Q. land treatment program were not evaluated.

Note: Land treatment beneficial effects were not evaluated.

A P P E N D I X D

Wildlife Habitat Data

TABLE I
WILDLIFE HABITAT UNITS BY LAND COVER
Middle Creek Watershed, Kansas

<u>Land Cover</u>	<u>Rated Value</u>	<u>Total Habitat Units</u>		
		<u>Present</u>	<u>Future w/o</u>	<u>Future w/project</u>
HERBACEOUS				
Cropland	3.0	45,264	45,264	45,243
Grassland	5.0	266,360	266,365	265,610
Compensation	---	---	---	590
Total Herbaceous		311,624	311,629	311,443
WOODY				
Woodland	6.2	7,105	6,671	6,417
Compensation	---	---	---	250
Total Woody		7,105	6,671	6,667
AQUATIC				
(Stream)				
Ephemeral	3.0	315	315	298
Intermittent	5.0	100	100	71
Perennial	7.0	70	70	56
Total Stream		485	485	425
(Flatwater)				
Pond, Lake	6.3	1,002	1,002	2,249

August 1982

TABLE II

Wildlife Habitat Compensation Alternatives
for Middle Creek Watershed
Chase, Marion, and Morris Counties
September 12, 1980

Site	Alternate 1				Alternate 2		
	Habitat Units		Habitat Units		Habitat Units		Net Change
	Lost	to be Compensated	Acres to be Revegetated	Woodland Herbaceous	Riparian Based upon Woodland 10-R value of	Est. Acres to be Retained	
Number	Woodland Herbaceous	Woodland Herbaceous	Woodland Herbaceous	Woodland Herbaceous	Woodland 10-R value of		(Habitat Units)
3	-	65.0	-	30	3	-	-35H
4	6.2	126.0	6.2	50	5	1.6	-76H
5	61.0	23.0	61.0	23	3	19.1	+7H
6	-	88.6	-	50	5	-	-39H
8	75.0	58.7	75.0	59	6	30.0	+1H
9	76.6	88.3	76.6	50	5	14.5	-38H
10	-	78.0	-	60	6	-	-18H
11	31.0	202.0	31.0	100	10	8.2	-102H
12	-	74.0	-	50	5	-	-24H
13	-	172.0	-	60	6	-	-112H
14	-	155.0	-	50	5	-	-105H
TOTAL	249.8	1,130.6	249.8	582	59	73.4	-541H

Habitat units equal the rated quality value (variable 1 to 10) multiplied by acres. Compensation may be accomplished by Alternate 1 which is new plantings, by Alternate 2 which is retention and improvement of existing woodland, or by a combination of the alternatives.

A P P E N D I X E

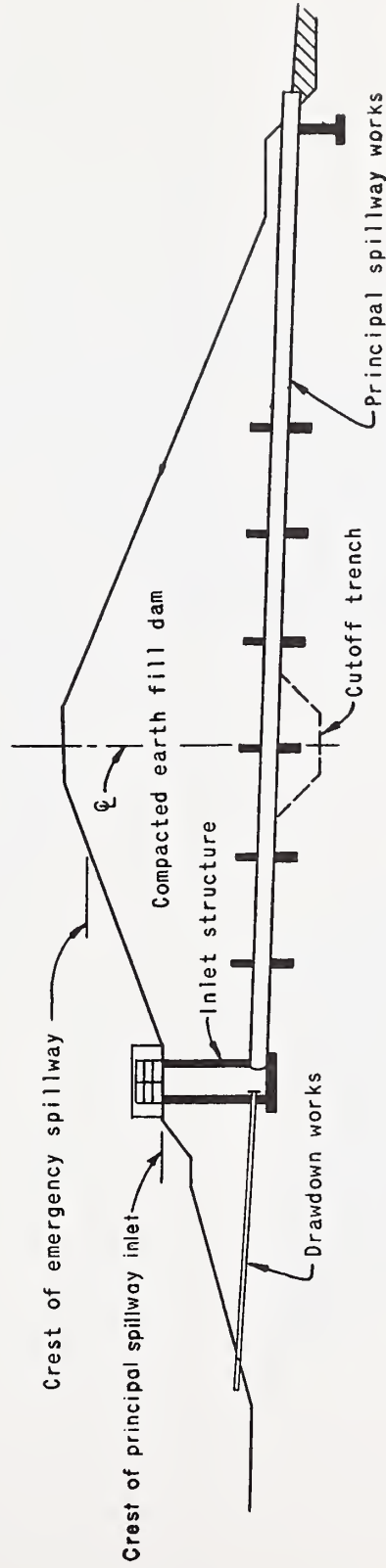
Typical Earth Dam With Drop Inlet Spillway

Cottonwood Basin Map

Project Map

SOIL CONSERVATION SERVICE

TYPICAL EARTH DAM WITH DROP INLET SPILLWAY



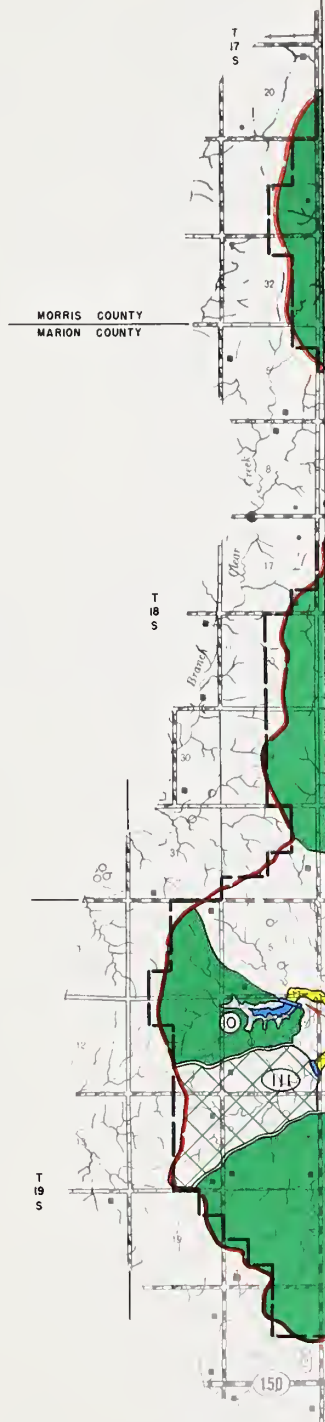
CROSS SECTION OF DAM ON CENTERLINE OF PRINCIPAL SPILLWAY

NOTES:

1. FOR INDIVIDUAL STRUCTURE DATA SEE TABLE 3.
2. EMBANKMENT AND FOUNDATION DESIGN FEATURES NOT SHOWN.

②

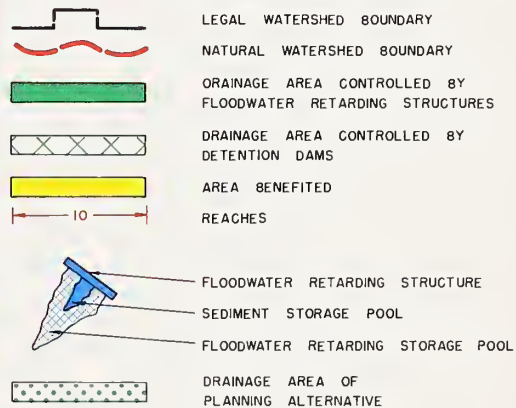




DRAINAGE AREA IN ACRES

① 3341	⑩① 1504
② 2131	⑩② 787
③ 922	⑩③ 1517
④ 2771	⑩④ 992
⑤ 1030	⑩⑤ 576
⑥ 1997	⑩⑥ 832
⑦ 2259	⑩⑦ 461
⑧ 2061	⑩⑧ 659
⑨ 3718	⑩⑨ 1030
⑩ 896	⑩⑩ 352
⑪ 3456	⑩⑪ 826
⑫ 1286	⑩⑫ 602
⑬ 1120	⑩⑬ 755
⑭ 1664	
⑮ 1581	

LEGEND



PROJECT MAP
MIDDLE CREEK WATERSHED
MORRIS, MARION & CHASE COUNTIES

FROM INFORMATION FURNISHED
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SOIL CONSERVATION SERVICE

AUGUST, 1972











SCALE 0 1 2 3 MILES

KANSAS

DRAINAGE AREA IN ACRES

①	3341	⑩①	1504
②	2131	⑩②	787
③	922	⑩③	1517
④	2771	⑩④	932
⑤	1030	⑩⑤	576
⑥	1997	⑩⑥	832
⑦	2259	⑩⑦	461
⑧	2061	⑩⑧	659
⑨	3718	⑩⑨	1030
⑩	896	⑩⑩	352
⑪	3456	⑩⑪	826
⑫	1286	⑩⑫	602
⑬	1120	⑩⑬	755
⑭	1864		
⑮	1581		

LEGEND

-  LEGAL WATERSHED BOUNDARY
-  NATURAL WATERSHED BOUNDARY
-  DRAINAGE AREA CONTROLLED BY FLOODWATER RETARDING STRUCTURES
-  DRAINAGE AREA CONTROLLED BY DETENTION DAMS
-  AREA BENEFITED
-  REACHES
-  FLOODWATER RETARDING STRUCTURE
-  SEDIMENT STORAGE POOL
-  FLOODWATER RETARDING STORAGE POOL
-  DRAINAGE AREA OF PLANNING ALTERNATIVE

PROJECT MAP
MIDDLE CREEK WATERSHED
 MORRIS, MARION & CHASE COUNTIES

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